

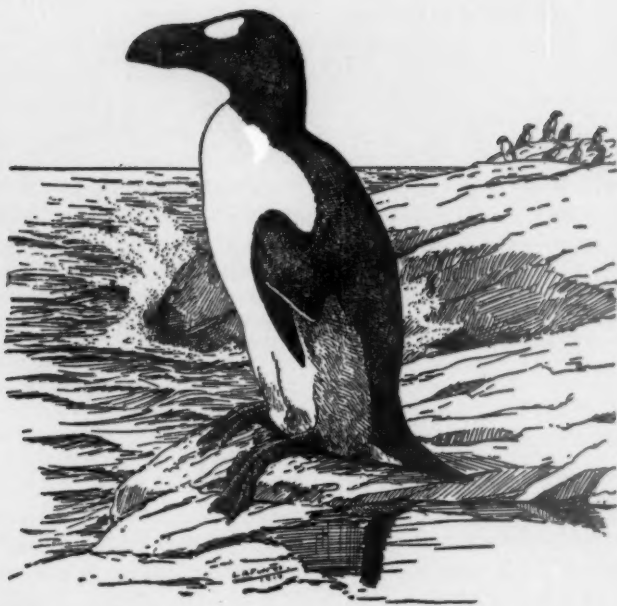
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ZOOLOGY OF THE BAIRD EXPEDITION (1950)

I. THE BIRDS OBSERVED IN CENTRAL AND
SOUTH-EAST BAFFIN ISLAND

BY V. C. WYNNE-EDWARDS

INTRODUCTION

THE Baird expedition (1950) was based at Clyde, approximately 70° N, on the east coast of Baffin Island. The party was conveyed there by air and landed on the sea ice on May 19 and 20 (Baird, 1950, 1951). Diverse scientific interests were served by the establishment of a number of camps in the interior, during the next few days, by our 'Norseman' aircraft; the zoological unit, consisting of Alexander Anderson and me, took up permanent quarters at Camp B, at the head of Clyde Inlet, on May 24. We stayed there 12 weeks, devoting our attention to the collection of plants, freshwater and terrestrial animals, and above all to a study of the breeding birds.

Between August 14 and 19 we made an important excursion to the south to visit Cape Searle (67° 13' N, 62° 30' W), the site of an immense colony of fulmars. The airplane landed us at Padloping, 250 miles southeast along the coast from Clyde; from there we reached Cape Searle Island, about 25 miles distant from Padloping, by boat, and remained there two nights.

Some observations were made at Frobisher Bay Airfield, in southern Baffin Island, where a few days were spent on the inward and outward journeys, and also at other camps of the expedition in the Clyde area.

Previously, in 1937, I had accompanied Commander Donald B. MacMillan on an expedition to Frobisher Bay, in the Gloucester schooner *GERTRUDE THEBAUD*. The vessel reached Acadia Cove, Resolution Island, on July 27, and during the next 12 days made stops at the Lower Savage Islands, York Sound, and other fiords on the south shore of Frobisher Bay, as well as Brewster Point and Peter Force Sound on the north shore. After coasting the north shore of the bay outward bound on August 8, we sailed more than 200 miles to the

northeast in Davis Strait, sighting no land after passing Lady Franklin Island; during the night of August 9-10 we met heavy pack ice about $65^{\circ} 45' N$ (in the latitude of Cape Walsingham), and turned south, on a direct course for Cape Mugford, Labrador.

Though there is a report on file in the National Museum, Ottawa, of my own observations in 1937, some of the material has been included here, since the report has never been published.

I am very grateful to Lt.-Colonel P. D. Baird and the Arctic Institute of North America for inviting Anderson and me to join the expedition, and for the generous and well-planned facilities placed at our disposal; and also to the University of Aberdeen for granting us the necessary leave of absence. Alexander Anderson was the best of companions and most useful of helpers. His excellent field-observations have been freely incorporated in this paper, and the skins he prepared have been indispensable.

The most important, as well as the most recent, contributions to the ornithology of Baffin Island are those of J. Dewey Soper (1928, 1934, 1940, 1946), who noted the publications of most of the earlier naturalists. The areas visited by the present writer happen not to overlap at any point the much more extensive journeys of Soper. Cumberland Gulf was an important base for the latter's work, as it was also for Kumlien (1879), the pioneer naturalist of the region, and again for Hantzsch (1929, 1930). I have not entered Cumberland Sound at any time; Frobisher Bay lies to the south of it, and Cape Searle and Clyde to the north.

Cape Searle was visited in May, 1884, by Franz Boas, the ethnographer, on his sledge journey from Cumberland Sound to Kivitoq (Boas, 1885). An important collection of plants was made there by James Taylor (1863), an Aberdeen surgeon on board the Scottish whaling vessels in the years 1856-61. These seem to have been the only previous visits by naturalists; for though Kumlien (1879: 102) refers to the fulmars, it is evident that he did not see the place with his own eyes.

Clyde was briefly visited (and named) in 1818 on Ross's First Voyage, and again on Parry's First Voyage in 1821. More than a century later, from August 14 to 29, 1934, T. G. Longstaff and C. T. Dalgety, who (with Baird and Hanham) were then members of Wordie's expedition, made observations and zoological collections at Eglinton Fiord and Clyde Inlet (*cf.* Dalgety, 1936).

CAMP B

The largest part of our time was spent in the vicinity of Camp B ($69^{\circ} 50' N$, $70^{\circ} 25' W$) at the head of Clyde Inlet. When we arrived,

about the same time as many of the migrant birds, the sparse snow-cover was fast disappearing, though spring had barely come. We remained there long enough to see the high ground white again with new snow, and many of the birds already departed for the winter. It may be made clear at this point that the premature arrival of autumnal frost and snow puts into "cold storage" the summer's crop of vegetation, and there is consequently found in early spring an abundant supply of herbage, seeds, buds, and even berries (e. g. of *Vaccinium uliginosum* and *Empetrum nigrum*) of which the birds and mammals can take advantage.

Clyde Inlet is a deep, narrow fiord, about 70 miles in length; it is carved through a coastal belt of mountains attaining heights of 1200-1500 meters. The tops of these are mostly capped with continuous, many-domed ice fields of great extent, from which glaciers descend, in some places right into the fiord. The inlet has been cut through the highest parts of this alpine region, and at its head there opens a broader valley, occupied by the Clyde River. To the west, the country is still exceedingly rough and barren, but the relief is lower and there are no glaciated mountain tops until, finally, some 40 miles southwest of the fiord-head, the river takes its source in the Barnes Ice Cap, a "continental" sheet of moderate size, astride the height of land.

Clyde Inlet is but one of scores of long fiords on this coast, but it differs from others seen by us in the oasis-like character of the lowland at its head. Here there are some square miles of country lying below 150 meters; a considerable part, it is true, consists of terraced gravel flats almost devoid of vegetation and exposed to the sand-blast and scouring of frequent gales. But these are bordered by more sheltered pockets of meadow with ponds and marshes, and pasture-like slopes covered with a fairly continuous carpet of vegetation. The flora and insect-fauna both contain species hitherto unknown north of the Arctic Circle in Baffin Island, or in a few cases altogether new to the country. All six of the small passerine birds now known to breed in Baffin Island are locally plentiful, a circumstance never recorded elsewhere, even in the south. (Baffin Island is roughly the area of Texas, and larger than any wholly European state; it extends some 600 miles southward of our position.)

Writing of analogous localities in Greenland, Salomonsen (1950: 8) says: "There is a pronounced difference between the foggy, maritime climate of the coast and the continental climate of the inland belt with intense summer insolation, semi-arid conditions and a mean temperature in the summer months at least 2° C. higher than on the coast. These differences greatly affect both the vegetation and the terrestrial

animals." By way of illustration, mosquitos appeared at Camp B on June 25 and were still troublesome on windless days when we left the camp seven weeks later, on August 12; on the coast at Clyde, by contrast, little account need be taken of mosquitos, which are observed only in small numbers for about two weeks at most. On July 29 the shade temperature reached 70° F. at Camp B, exceeding by 6° the maximum at Clyde the same day, which was the highest yet recorded there.

DAILY TEMPERATURE ANALYSIS AT CAMP B, 1950

	May	June	July	August
Number observation days	7	25	31	30
Minima 32.5° or below	(6)	17	6	5
Minima 40° or above	0	1	10	5
Maxima below 40°	3	1	0	0
40-50°	4	21	10	21
50-60°	0	4	14	9
60-70°	0	1	6	0
above 70°	0	0	1	0
Mean temperature	35.9	38.6	46.2	42.6

These favorable conditions, corresponding to the "grass tundra" of Nordenskjöld (1928) and Soper (1940, 1946) are confined to elevations below about 180 m.; above that height the hillsides are covered with loose stones or bare crags; while the plateaus at 600 m. were snow-free for only 8 to 10 weeks in July and August, sparsely vegetated by only the hardiest of plants, and inhabited by scattered Snow Buntings, larks, lemmings, weasels, and foxes. Within a mile or two of the river therefore, on either side of the valley, were the stone-fields of the "desert tundra," passing higher up to permanent ice-fields of the "polar desert."

Our camp was at first situated on the gravel flats, where from its first arrival the aircraft could land on wheels; but a series of strong and damaging winds drove us to seek a more sheltered site, which we found in perhaps the most densely populated of all the grassy pockets. It was known to us as Falcon Hollow and is a basin of some 200 acres (80 ha.) extent, traversed by a small river (Falcon River) coming from the highlands to the west. The basin is cut off from the main flats by a low ice-smoothed, rocky ridge (Falcon Ridge), through which the river cuts. These names were derived from a Gyrfalcons' eyrie, a conspicuous landmark situated not half a mile from our camp, on a low overhanging cliff of Falcon Ridge, which commands a magnificent view over the terraced flats to the fiord-head a mile away, and the crags and mountains which form the walls of the valley beyond.

Especially in July and August, when the ice-bridges had all disappeared, we stayed chiefly on the northwest side of Clyde River, working regularly west some five miles past "Kranck Lake" and over grassy country, to "Marble Canyon." Eastward a low divide separates Falcon Hollow from "Caribou Valley," watered by a stream of larger volume than the Falcon. This plunges diagonally down the precipitous hillside in a narrow cleft of recent origin, in which there are concealed a thousand feet of beautiful cascades. For a week at the end of June, when the snow was vanishing from the hills above, we were unable to cross the Caribou River, and could cross the Falcon only with difficulty; our movements were then narrowly restricted. Beyond the Caribou Valley, in which the stream runs out to the fiord-head over a braided outwash fan, lie the three "Pipit Lakes," and beyond them the "Pipit Hills," about 300 meters in height; these, three miles from the camp, formed the eastern limit of our intensive work.

The area of most concentrated study was thus about eight miles long, from Marble Canyon to the Pipit Hills, and a mile or two wide. It was bounded on the southeast by the main river and fiord, and on the northwest by the steep hills which we knew as Dyke Mountain (above our camp) and Dryopteris Mountain further east (above the Pipit Lakes). The latter mountain was 950 meters in height, with a 300 meter cliff-face falling to the Pipit Lakes.

Excursions beyond these limits were undertaken rather infrequently, although those made from day to day within them must have totaled 1000 miles by the time we left.

In the course of the summer the permafrost level receded about one meter beneath the ground surface where there was no vegetation. Snow Buntings nested freely in rock-cracks, usually but not always in sunny situations where the cold is kept well back from the surface; and both they and the Wheatears used shallow holes in the ground. A continuous blanket of vegetation, such as that formed especially by *Cassiope tetragona*, conserves the frost, with the result that its gradual thawing can serve as a steady source of moisture within reach of the roots. Lemmings' old winter nests, built in or under the snow and later found lying about, often contained a lump of ice up to the end of June, revealing the great effects of relatively trifling insulation.

We could not cross the Clyde River on ice-bridges after June 10. By June 30, the river, swollen by spring floods, had begun to eat away the fiord ice. In the next few days the open water rapidly increased, by July 7 extending more than 10 miles down the fiord and out of sight. On that day the larger lakes were not entirely free of ice;

Kranck Lake was finally clear on the 17th, after which the surface temperature could rise rapidly above 0° C. (Two days later it was possible to swim with enjoyment at the shallow west end, so hot was the weather at that time.)

We wished to avoid disturbing the birds breeding in our vicinity, and collecting of series of specimens was considered secondary to making observations on their habits and reproduction.

1. COMMON LOON, *Gavia immer* Brünnich.—One seen in small pond at York Harbor, Frobisher Bay, on July 28, 1937; six flying over Peter Force Sound on August 4, 1937.

2. RED-THROATED LOON, *Gavia stellata* Pontoppidan.—First seen at head of Clyde Inlet on June 7, and constantly thereafter.

A bird was sitting on a nest containing two eggs, on a grassy point beside a shallow pond on the East Flats on June 24. A single chick hatched; it was seen first on July 18 and was still on same pond two weeks later. On July 21 it was covered with uniform sooty down, and already held its short beak high in the air like its mother beside it.

A second nest, on damp grass beside one of the south side ponds, was found with two fresh eggs on July 8; on or before August 8 this nest was robbed by an arctic fox, which left its droppings in the nest.

Red-throated Loons were seen in most localities visited, including Camp M₁ at the head of Eglinton Fiord; also in southeastern Baffin Island at Acadia Cove, Resolution Island (July 27, 1937) and Brewster Point, where two almost-fledged young were seen, August 3 to 6, 1937.

3. SMALL-BILLED FULMAR, *Fulmarus glacialis minor* Kjaerboelling.—*Procellaria minor* Kjaerboelling, Danmarks Fugle, 1852: 324 (cf. Salomonsen, *Birds of Greenland*, 1950: 41.)

A fuller account of the Cape Searle colony (67° 13' N, 62° 30' W), one of the four or five fulmar colonies at present believed to exist in Canada, has been prepared for publication in 'Arctic' (Wynne-Edwards, 1952). A colored reproduction of the remarkable site appears in Fisher (1951).

Anderson, Hale, and I spent the nights of August 15 and 16 on Cape Searle Island, being taken off in the afternoon of the 17th; on the 19th we flew along the cliffs in the airplane. Owing to their success in a walrus hunt as we approached the island, our Eskimos had to return home to Padloping loaded with the meat, and left us without a boat. From the island itself, which is exceedingly rugged, only part of the Cape is visible. It ends in two massive towers about 425 meters in height, which fall sheer into the sea; the inner one is flat-topped and resembles a Gothic tower of colossal proportions; it entirely conceals the slightly smaller, outer one from view. They are joined together and to the main part of the island by sharp ridges, bearing such bizarre pinnacles that "saw-toothed" would be a misleading understatement. The fulmar colony occupies all sides of the towers, and the cliffs joining and adjacent to them for one to one and one-half miles on each side of the island. We viewed the colony both from the cliff tops, 330 meters up and and still 1000 meters from the great tower, and also from the beach below on the south side. The summits of both towers support a luxuriant growth of nitrophilous vegetation, in spite of the extreme severity of their exposure; and in this vegetation, in an evenly-spaced pattern on each summit there were one or more thousand nests.

The cliffs consist of ancient volcanic deposits, chiefly horizontally-bedded tufts, weathered into elaborate niches, buttresses, and crumbling spires. Fulmars nest throughout the entire height, but much more abundantly above 300 meters. The upper parts of the cliffs are brilliantly colored by the orange lichen, *Caloplaca elegans*. Suddenly disclosed to us for the first time as we rounded the head of Padloping Island, towering out of the berg-strewn waters of Davis Strait, the Cape presented a scene of surpassing grandeur and beauty.

It was desirable to make some estimate of the population, which I placed after careful consideration at 200,000, being the number of birds supposedly present; in most cases one of each pair is present at the nest, though many chicks were at that time unattended, and a large but unknown proportion of pairs have a nest-site but no egg or chick. The estimate should be accepted only as a well-considered guess, likely to be correct within a factor of two in either direction (*i. e.* 100,000 to 400,000). It is based partly upon sample counts of the visible nearer parts of the cliffs, upon the myriad specks sailing in a cloud over the summit and for half a mile down wind, and partly upon the numbers seen feeding and counted at sea during our approach and departure by boat and airplane.

No description of this site has previously been given, and there appear to be but two references to it in the literature. Kumlien (1879: 102), had he seen the fulmars on the cape himself, would certainly have given some indication of the magnificent setting, as he did in referring to a lesser colony which he had seen on Disko Island, Greenland; the fact that he referred incorrectly to the site as "Padlie Island" is of no significance, since the "Cape Searle" of Ross was not re-identified until several years later, by Franz Boas (1885). Boas came, as we did, along the south side of Padloping Island, and turned west through the narrow passage between it and Cape Searle Island, traveling by dog-sledge on the sea ice a day or two after May 22, 1884. What he saw there we shall never know, for the only reference to the place is the Eskimo name on the map, K'akhodluin, translated in his list of place-names as 'die Sturmvoegel' (p. 92), identified with the "Cape Searle" of Ross, and tentatively with "Sanderson's Tower" of Davis, in the "Synonyma" listed on pp. 94-95. My own attention was drawn to Cape Searle (Wynne-Edwards, 1939: 128) by Dr. L. D. Livingstone in 1937, when he was Medical Officer at Pangnirtung.

One other colony in Baffin Island has been reported during this century, namely that discovered by Peter Freuchen facing the open entrance of Admiralty Inlet, between Elwin Bay and Baillarge Inlet (Hørring, 1937: 43). Freuchen remained there from April 23 to May 7, 1924, and reports "so vast numbers . . . as to give the impression of Guillemot cliffs and in some places Little auk cliffs." The birds traveled to and fro across the ice, between their snow-covered nest-sites on the cliffs and the open water.

Dr. Livingstone discovered, about June 1, 1927, a third large Baffin Island colony on the 500-meter cliffs at the mouth of Coutts Inlet (72° N, 74° 30' W), farther north on the Davis Strait coast. This has not yet been revisited, and his record of it (in the National Museum of Canada) has not heretofore been published. A fourth big Canadian colony was discovered by Capt. O. Sverdrup at Cape Vera, Archer Peninsula, Devon Island (76° 12' N, 89° 25' W) on August 8, 1900 (Schaanning, 1933: 162). Other colonies most probably exist, including one recently reported by Eskimos on the Kakhodluin Island in Exeter Sound, Baffin Island (66° 15' N, 62° 15' W). Fisher (1952: 335) also refers to "an island off Ellesmere Island." The small rocky islands near Quickstep Harbor, Cumberland Sound, where Kumlien found a few nesting in July, 1878, do not appear to have been revisited, though Soper

was in that neighborhood on a winter journey in January, 1926. Comparable colonies exist in Greenland, notably at Qeqertaq in Disko Fiord; a graphic description of the Greenland colonies, to which Cape Searle bears a close resemblance, may be found in Salomonsen (1950: 33-37).

We gave attention to the proportions of dark- and light-colored birds, confirming the reports of Kumlien (*loc. cit.*) and Dalgety (1936: 585) that dark birds predominate in this area. Since every gradation exists, between the lightest and those so dark that I have on occasion momentarily mistaken them for Sooty Shearwaters, the difficulty is to reduce the proportion to figures. In British waters only "light-phase" or white-bellied birds normally occur, though there is a small but quite perceptible range of individual variation (*cf.* Witherby, Vol. 4: 79, footnote, 1940). We counted as "light" birds any which would have passed without comment around the Scottish coast or in the North Sea; all others were "dark"; and the latter therefore include the main bulk of gray-headed intermediates as well as the true "blue-phase" or fully melanic birds. On this basis 67 of a total of 499 birds were "light"; that is, 13 per cent "light," and 87 per cent so-called "dark." Extremely dark birds are nevertheless far from predominant, perhaps no more common than those called "light."

The chicks near enough to examine with binoculars appeared mostly one-half to two-thirds the size of the adults; that is, they were about two weeks old (the growth-rate being remarkably rapid in the fulmar), having hatched in the first days of August from eggs laid about the second week of June. A few chicks may have been a week older, and in some it was possible to see the first growth of quill-feathers on the manus. The color of the (first?) down was French gray or dove-gray, slightly variable, but not more so than in Scotland and not nearly as variable as in the adults; in particular, the chin and breast may be paler than the upper parts, or they may be the same color. There were no chicks with white heads (Witherby, *loc. cit.*).

Looking down, we saw an arctic weasel hunting the ledges near the top of the cliff, scrambling with no apparent concern for the fact that the loose pebbles it dislodged fell some 150 meters. It was perfectly evident that, after two months and more of diligent search, no nests remained anywhere within its reach. Other predators seen there include 20 or more pairs of Glaucous Gulls, a pair of Ravens, a White Gyrfalcon, and at least two Peregrine Falcons. At the foot of the tower on the south side there is an acre or two of level ground covered with huge boulders, and among these we found scores of wings and corpses of fulmars, besides rusty cans and other signs of Eskimo visits. We collected three specimens, and, eating the breast-meat, found it delicious, and preferable to Brünnich's Murres and Black Guillemots which we ate at the same time. This does not accord with opinions frequently expressed, though it confirms my experience on the Grand Bank, where the Newfoundland fishermen prefer shearwaters to any of the auks.

There were no other sea fowl sharing this colony, except the Glaucous Gulls, which kept to themselves on some lower cliffs on the south side, and a few Black Guillemots, which may or may not have been breeding.

I am in agreement with Salomonsen (1950: 41) and others in recognizing the fulmars of Baffin Island as *Fulmarus glacialis minor* Kjaerbølling. When North American specimens are compared with those from Europe (for which Witherby (*op. cit.*: 80) gives "bill from feathers" in males 38-43 mm., females 36-40 mm.) the smaller bill-size of the former is immediately apparent, as the figures on the next page show.

Salomonsen re-measured the specimens of the 5th Thule Expedition from Admiralty Inlet and found the average bill-length of 21 males was 35.9 and of 6 females 33.1 mm. (Hørring on the same specimens obtained 36.0 and 34.1). These are

perhaps even smaller than those from Cape Searle (one male 37.9, two females ave. 34.2).

The wing-lengths of the Cape Searle birds fall within the range of East Atlantic fulmars; but I note that the overall length of the skull, and not merely the bill, is some 15 per cent greater in typical *glacialis* than in my specimens of *minor*.

That both subspecies occur in temperate waters off the eastern seaboard of Canada and the United States is to be expected: confirmation is given by a bird I received in the flesh through the courtesy of Dr. V. D. Vladikov on November 29, 1935, taken

Fulmarus glacialis minor

No.	Locality	Year	Color	Sex	Culmen in mm.	Wing in mm.	Body weight in grams	Rectal tempera- tures Cent.
A 76	Cape Searle	1950	dark	♀	32.8	314	565	38.9
A 78	Cape Searle	1950	dark	♀	35.5	329	595	41.0
A 79	Cape Searle	1950	intermediate	♂	37.9	314	740	41.0
	Cape Searle	1950	—	—	34.3	—	—	—
(Skull, with bill scales in place)								
3	Cape Bauld, Newfoundland	1934	dark	♀	33.5	(molt)	625	—
5	Cape Bauld, Newfoundland	1934	light	♀	36.6	333	765	—

on the deck of a steam-trawler 85 miles east-southeast of Chebucto Head, Nova Scotia, at about 44° 10' N, 61° 50' W. This bird's culmen measured 41 mm; it was a male, light-phase, weighing 795 grams when received in Montreal; it is interesting to record that the stomach contained 80-100 bladders of gulf weed, apparently *Sargassum vulgare*, besides a few small stones.

Fulmars are numerous and well-distributed in the summer months in Davis Strait and Baffin Bay, not penetrating as a rule into Cumberland Sound or Frobisher Bay much beyond the limit of floating ice. We saw two in Clyde Inlet on August 5 about 50 miles "inland" among the mountains and glaciers of the "alpine zone," and Mr. George Riley, one of our geologists, saw one a number of times in a similar situation, where the fiord walls are 1200-1500 meters high, near the head of Walker Arm, Sam Ford Fiord, about July 23.

4. ?CANADA GOOSE, *Branta canadensis* (Linnaeus).—At Camp B on May 31, I saw two large dark geese flying east-northeast, and thought I could discern the black and white pattern of the head and neck. Another, still less certainly identified, was seen with four Snow Geese on June 11. If these were not Canadas, it is difficult to know what other goose they could have been. Canada Geese have in recent years established themselves in west Greenland (Salomonsen, 1950: 86), and may be extending their range in the "Eastern Arctic" also.

5. SNOW GOOSE, *Chen hyperborea* Pallas.—At Camp B first seen (by Mr. Mason Hale) on May 29, 1950, and thereafter in parties of one to seven on June 1, 4, 5, 8, 10, 11, and 26. At this time they settled several times near the camp and once remained overnight.

At Refuge Harbor on Gibbs Fiord, Riley saw a flock of some 400 geese, which he believed to be Snow Geese, flying north on May 31. Riley also discovered, and photographed recognizably, a pair of Snow Geese with seven downy goslings, each

about 20 cm. long, at the head of McBeth Fiord on August 4. This is 30 miles southeast of Camp B.

At Frobisher Bay Airport an adult and three young birds in gray plumage were seen, flying down the bay, on September 6.

6. BRANT, *Branta bernicla* (Linnaeus).—A bird which remained 30 minutes in his vicinity at the head of Gibbs Fiord on June 21 was confidently identified by Riley as a Brant. It would presumably have been the white-breasted form.

Clangula hyemalis COLLECTED AT THE HEAD OF CLYDE INLET

Number	Date	Sex	Wing	Weight	Body temperature
A 70	August 15	♀	205 mm.	650 g.	—
A 71	August 15	♀	203	750	—
A 82	August 30	♂ imm.	—	600	42.0° C.

7. OLD-SQUAW, *Clangula hyemalis* (Linnaeus).—A pair appeared at the ponds on the East Flats near Camp B on June 15. A duck was found sitting there on six eggs on July 10. The nest was in a sedge tussock beside a shallow pond, and composed chiefly of dry sedges, without much down. The duck fouled the eggs when flushed.

Ducklings were seen at the "Lepidurus Pond," two miles west of the fiord-head, on August 2, and there were molting adults there from July 18 onwards.

A party of 17 drakes, 13 in full nuptial plumage, was feeding among boulders in shallow water at the head of the inlet on July 8. Nineteen drakes, eight having long tails, were seen in Cormack Arm on August 5. It appears that the characteristic long central rectrices may be lost by some birds even before they start breeding, but there is some variation; adult birds with and without them were seen in June, July and August.

Old-squaws were seen at Clyde on August 31, and reported by other members of our party from Bray Island and Lake Gillian, Foxe Basin, on August 10 (hundreds of birds), and Gibbs Fiord. None were seen by me in Frobisher Bay in 1937 or 1950.

8. COMMON EIDER, *Somateria mollissima borealis* (C. L. Brehm).—In 1950 these birds were identified with certainty only along the northwest coast of Padloping Island, where 50 or more were seen, including drakes in eclipse. Owing to the difficulty of distinguishing female and immature birds of this species from those of the King Eider, some doubt must be attached to the record of 18 female eiders, and 2 downy ducklings, on Cormack Arm, Clyde Inlet, August 5.

In 1937 Common Eiders were seen daily at York Harbor, Brewster Point, and Peter Force Sound (all in Frobisher Bay), July 28 to August 7. Two small rafts of ducklings were seen at York Harbor on August 2 and a nest composed of *Cladonia* and down and containing 5 eggs was found on a hillside some 500 meters from the sea at Brewster Point, August 6.

Eight females collected in Peter Force Sound, August 4, had the following weights: 1.84, 1.68, 1.53, 1.47, 1.45, 1.39, 1.30, 1.22 kg., average 1.485 kg. (= 3 lbs. 4 oz.). The stomach of one contained recognizable remains of the polychaete *Aphrodite* sp., the gastropods *Littorina rudis* and ? *Buccinum* sp., and the amphipod *Caprella* sp.

9. KING EIDER, *Somateria spectabilis* (Linnaeus).—On the afternoon of July 19, after about three hours spent at the mouth of the river near Camp B, we were surprised by a flight of 150 to 200 King Eiders, all drakes in full plumage, presenting a remarkable sight as they flew 6 to 10 meters above the water, more or less in line abreast, to disappear into the distance down the fiord. This was our first intimation

of what developed thereafter into an important migration. On July 21 and 23 more flocks totaling many hundreds were seen, some passing on and others resting on the fiord in close-packed formation, evidently feeding; watched from high on the mountainside the latter appeared now white, as all the heads and breasts turned towards us, and now black, as they turned the opposite way. An hour before midnight the same evening I happened to see a dense flock (traveling north-eastwards like all the others) passing across the face of the opposite cliffs some 500 to 600 meters above the fiord. On August 4, as we traveled down the fiord by canoe during the "night," flock after flock overtook us, some merely skimming the water, some as high as three or four thousand feet. These birds were adult drakes, excepting one bird in brown plumage seen on July 23, and a small proportion of the thousands seen on August 4. On August 7 a flock of over 100, passing down the river at 10:30 a.m., consisted exclusively of adult males. Anderson collected a year-old male there on August 30.

A more remarkable impression was obtained at Camp A₃, at the southeastern extremity of the Barnes Ice Cap, 40 miles southwest of Camp B. Dr. W. H. Ward informs me that the birds were first noted passing east on July 14; thereafter they were seen regularly in fair weather, chiefly between 8 p.m. and 3 a.m., and usually in batches up to about 500 at a time. In fine weather he estimates there would be on the average 500 to 1000 a night. (A flock was seen to pass in the reverse direction on one occasion, August 11.) The last observation of which a written note was kept by him was on August 17.

Most of these flocks passed low over Camp A₃, following the shores of the lake there; they had evidently skirted the southern edge of the ice cap, after crossing the main divide from Foxe Basin some 12 miles to the west, where "Flyway Lake" has been named accordingly. The height of land is here only 440 meters, probably the lowest crossing to be found in this narrow central waist of Baffin Island. From A₃ there is no reason to doubt that they followed the course of Clyde River, passing over us at the head of the fiord and continuing out to Baffin Bay. On September 5, just after taking off from Clyde for the last time, we flew above dense flocks of black-looking ducks, almost certainly of this species, resting on the water near the fiord mouth.

Away from this narrow route only one observation was made, by Mr. George Riley who saw a flock of between 30 and 100, consisting mostly but not entirely of birds in adult male plumage, at the head of Gibbs Fiord on June 20. These birds stayed there all day and returned inland in the evening.

It is interesting to notice briefly how these observations are related to previous knowledge of the distribution and movements of the species. The King Eider breeds commonly all around the shores of Foxe Channel and Basin (Soper, 1946: 23; Bray, 1943: 513), northwards to Admiralty Inlet (Freuchen in Hørring, 1937: 18), and thence further to Ellesmere Island, North Greenland, and the central Arctic.

The spring arrival on the breeding grounds takes place from April, onwards. Very probably the migration is over the frozen sea and not across the interior, so far as Baffin Island is concerned; Soper (1946: 24) says "the species prevails in large numbers all along the south coast during early spring, and then in most sections vanishes . . ." It does not reappear in the fall. Arrived at the breeding grounds "the sojourn of the drake is very short" (Salomonsen, 1950: 135); they stay for some time after the nest is established and the eggs are laid, however, "but early in July they disappear" (Bray, 1943: 513).

In west Greenland the July movement of males is to the south; they begin to arrive as early as July 6 in the Upernavik District, and by July 16 in Disko Bay

(Salomonsen, *loc. cit.*). "The maximum density is reached in the first half of Aug. when enormous flocks are congregated in the southern parts of Upernavik District, in the northern parts of Disko Bay, on all coasts of Disko Island and in Egedesminde District as far south as Kangatsiaq" (*op. cit.*: 136). The females do not leave the nesting grounds until September and October when the young are fledged and accompany them. In these months there is a gradual southward movement of males, females, and young to the winter quarters in southwest Greenland, from Cape Farewell to Holsteinsborg. "In S. W. Greenland the King Eider is extremely common in winter and is intensively hunted by the Greenlanders. The large number of males summering in the Disko Bay region and the vast multitude of birds wintering in S. W. Greenland cannot possibly all come from N. Greenland but comprises probably a large percentage of the population of the Canadian Eastern Arctic. Interesting evidence of this was the capture in early Jan. 1897 at Kangeq (Godthåb District) of an adult female carrying a copper arrow-head of the type used by the Eskimos of King William Land. A similar arrow-head was found in about 1850 in an Eider shot at Kangamiut (Sukkertoppen District), but it is not known whether this bird was a Common Eider or a King-Eider" (Salomonsen, 1950: 137).

Clyde Inlet lies exactly opposite Disko Island where (Salomonsen, 1950: 136) "the flocks are especially large . . . , often numbering thousands of birds"; the distance across is about 300 miles. Our observations fall perfectly into Salomonsen's pattern, and it seems not at all impossible that the route across the waist of Baffin Island, via Clyde River and Inlet, is followed by most of the drakes from the vast region of Foze Basin, and even further west. Probably they generally continue their journey unbroken, since the period of our observations coincides exactly with the time of arrival in Greenland, and no great concentrations have ever been observed at this time on the Baffin coast. Whether the same route is subsequently followed by the females and young we did not remain long enough to discover. Dalgety (1936: 584) saw in mid-August huge flocks of females in Eglinton Fiord and Clyde Inlet; it seemed to him "that 1934 was a 'non-breeding year' for King-Eiders in Baffin Land, that the males had flocked and gone away at their usual time, and the females were remaining near their breeding ground." This explanation may well be substantially correct for in 1950 the flocks at the same date still consisted entirely of males.

This migration preceding the eclipse molt, resulting in a tremendous concentration of the species at that time, is a close counterpart, on a larger scale, of the molt-migration of the Sheld-duck, *Tadorna tadorna*, in western Europe, recently brought to light (Coombes, 1949 and 1950). Nothing corresponding to it is at present known to occur in the case of the King Eiders breeding in the Old World Arctic.

10. ROUGH-LEGGED HAWK, *Buteo lagopus sancti-johannis* (Gmelin).—There seem to be no records of this species in southeast Baffin Island though it is known from Lake Harbor west to Cape Dorset. I observed one at Frobisher Bay Airfield (63° 45' N, 68° 33' W) on September 7, 1950, and on July 28, 1937, I climbed to a nest situated on a low cliff, near the northwest shore of York Sound, Frobisher Bay (62° 27' N, 66° 30' W). The nest contained five young birds in white down, with the wing-quills visible, and one infertile egg. There were remains of lemmings around the nest.

11. GREENLAND FALCON, *Falco rusticolus obsoletus* Gmelin.—The falcons' nest, overlooking the bare gravel flats from its secure position on "Falcon Cliff," was one of the landmarks of Camp B. It was placed in a niche about 20 meters up on a vertical, wind-eroded rock-face, overhung by the upper 12 meters of the cliff, and was inaccessible to us. By crouching on the edge of the overhang above, as far out

as caution admitted, a view could be had of more than half the actual nest. The eyrie showed up as a prominent white mark, seen immediately on our first arrival on May 24, when the falcons were already sitting.

The site was well chosen, not only for the commanding view, security and shelter it provided, but also for its southerly aspect. No rain could wash away the guano, which had accumulated for years. Down the steep slope at the foot of the cliff there were huge boulders, interspersed with rich vegetation. The ground was littered with remains of prey of bygone summers and harbored a den of the arctic fox. Shelter and sun perhaps accounted for the numerous droppings of arctic hare and Ptarmigan; and, with the important additional effect of the manured ground, the same circumstances were no doubt responsible for the presence of such noteworthy plants as *Taraxacum lapponicum*, *Ranunculus pedatifidus*, *Arnica alpina*, and *Arabis Hookeri* (the last being previously unknown in arctic Canada), besides *Potentilla nivea*, *Cochlearia officinalis*, and *Poa glauca*. A pond containing landlocked char lay at the foot of the slope.

On June 2 we looked into the nest for the first time; it contained three eggs, two of them being dark like those of the peregrine, and the third very much paler. On June 10 there were still three eggs, but on the thirteenth the young had hatched (though only one could actually be seen, since they had been moved back in the nest), and were being fed meat from a cock ptarmigan. By June 29, still sprawling, the young birds had begun feebly to work their wings. On July 10 I first heard them calling from the nest. On the eighteenth they were taking turns to stand on the edge of the ledge, and the down floated off their wings as they stood vigorously exercising their muscles. By July 24 they looked ready to fly, but did not do so until the twenty-ninth and thirtieth. I watched one take what appeared to be its first flight on the latter date, from the nest down to the gravel terraces 200 meters below. Thereafter the birds continued to frequent the cliff, sometimes standing on the nest ledge merely as one of a number of convenient perches.

The fledging period was at least 46 days, and at most 49 days.

The female was the parent usually seen at the nest, both incubating and feeding the young, although on May 29, when we put her off the nest, the male appeared, and soon after took her place, while she flew out of sight. Both adults were undergoing a molt of the flight and tail feathers during the period of incubation.

Remains of prey identified below the nest included *Lepus arcticus*, *Lemmus trimucronatus*, *Dicrostonyx groenlandicus*, *Lagopus mutus*, and *Calcarius lapponicus*. Lemmings were exceedingly scarce in 1950 and were not seen in the nest; the only species observed there were Rock Ptarmigan and a duck with yellowish toes and dark webs, almost certain to have been a King Eider. The male was seen hunting on a number of occasions, often standing motionless (like a peregrine) on a vantage point, waiting for something to show itself, and at other times sailing along the face of cliff and mountainside.

There was a second, unoccupied eyrie in a rather similar situation about two and one-half miles distant, on an overhung, almost cave-like cliff ledge about 15 meters above the waters of the fiord at Pipit Point. This nest was composed of old twisted willow sticks, buried in guano, and of great size; castings and remains found on the rock ledges below were very similar to those described above. It is possible that in good lemming years both these sites would be used; or they might be alternative sites, such as may not uncommonly be established by eagles, ospreys, and other large raptors.

A single white falcon was seen above the Glaucous Gull colony, near the landward end of the Fulmar cliffs at Cape Searle.

12. PEREGRINE FALCON, *Falco peregrinus anatum* Bonaparte.—Single peregrines were seen in the vicinity of Camp B on June 16, 28, and 30. On July 8, Dr. Pierre Dansereau and others found a hawks' nest in a rocky gully at the west end of Kranck Lake. This nest was on an open grassy ledge, easily seen from the opposite side of the gully; it contained four eggs when visited on the 9th, and on the 17th one egg and three young. Beneath the ledge was a luxuriant growth of nitrophilous plants, the principal species being among those already recorded as predominating below the Greenland Falcons' nest, namely *Taraxacum lapponicum*, *Potentilla nivea* and *pulchella*, and *Arabis Hookeri*.

Mr. Riley regularly observed a pair of Duck Hawks at the head of Gibbs Fiord, between June 27 and July 12. These appeared to be nesting low down on a high cliff, about one-half mile from the water. This appears to be the most northerly breeding station so far observed in Baffin Island (70° 37' N, 72° 30' W).

At Cape Searle single falcons were seen on August 15 and 17, 1950, and single birds were seen at Lower Savage Islands and Brewster Point, Frobisher Bay, August 1 and 7, 1937.

13. ROCK PTARMIGAN, *Lagopus mutus rupestris* (Gmelin).—Although Rock Ptarmigan are celebrated for their cryptic habits and coloration, courting and breeding adults call attention to themselves by croaking; and young birds, when present, may be easily found as soon as they can flutter. However, not one single brood of young, or any nest or group of more than a pair of birds together, were seen by any member of our expedition. My daily excursions on foot during the summer added up, as has been said, to about 1000 miles, yet the total number of ptarmigan seen was only nine. (In the Scottish Cairngorms I can normally see more than that in a day.) Moreover, 1950 seems to have been a complete blank in this area as far as reproduction is concerned, and contrasts with 1934 when Dalgety (1936: 590) records having seen in the Clyde district in August "coveys of eight to fourteen," and "thirty-five . . . in about half a square mile." According to information received by Anderson at Pond Inlet in September, 1950, however, the population round Navy Board Inlet was above average, flocks numbering up to 100 birds having been seen between September 1 and 6.

A pair shot at Clyde on May 21 showed no outward sign of molting into summer plumage. Another pair was collected near Camp B on May 29; the male was unmolted, but the female had more than half the feathers replaced on the crown, back of the neck, shoulders, and back. A hen seen on June 9 was more or less in summer plumage, but as late as June 23 one cock had dark feathers only on the crown and nape, and a spot on the breast. Its white plumage was yellowed and soiled. Salomonsen (1950: 172-173) has called attention to this long retention of the white plumage in the cock birds of high-arctic races. The cocks molt a month later than the females; it provides a remarkable contrast to the molt-cycle familiar to us in the Scottish Ptarmigan, *L. mutus millaisi*, in which cocks and hens molt simultaneously in April, before nesting begins.

The spring molt of the ptarmigan is a timely resource for the redpolls, Snow Buntings, and longspurs, whose nests are invariably lined with white ptarmigan feathers.

On August 27, while ascending Eglinton Tower Glacier, we followed the tracks of two ptarmigan a long way over the snow. Evidently they were molting rapidly, for there were contour-feathers dropped every ten yards or so, and a dozen around the two depressions in the snow where the birds had rested, perhaps for the night.

Two males shot on May 21 and 29 weighed 525 grams each, and two females, their mates, weighed 510 and 525 grams. At 3 p. m. the crops of the second pair were full and contained: (male) berries of *Vaccinium uliginosum* and *Empetrum nigrum*, numerous buds and a few unopened catkins of *Salix callicarpaea*, bud tips of *Saxifraga oppositifolia*, and leaves of *Dryas integrifolia*; (female) leaves of *Dryas* constituting 90 per cent of the bulk, otherwise the same except that there were no berries (Gelting, 1937: 102 ff.).

Scattered far by the gales from beneath the falcon's cliff, we found a number of old detached ptarmigan wings with white-shafted remiges. These we supposed at first to belong to Willow Ptarmigan (*L. lagopus*), which might have been expected as autumn visitors at the head of Clyde Inlet. But a careful examination of these wings convinced us that the original dark pigment of the shafts had been more or less completely bleached by the sun, perhaps in the course of several years, and that they belonged in fact to the Rock Ptarmigan. We imagined also that we could distinguish the fecal pellets of the supposed Willow Ptarmigan as being twice the common size and consisting of coarser fibers, and accumulated year by year on the ground in the willow thickets and among large boulders where the snow drifts deeply in winter because it is sheltered from the wind. (In this dry cold climate animal feces may easily endure five years; in many places, acres in extent, the ground beneath the vegetation is entirely covered, where the stones permit, by a layer of lemming droppings.) There is no doubt that these places are much used by ptarmigan in winter, but a careful comparison of the feces of ptarmigan and Red Grouse, *L. lagopus scoticus*, in Scotland, since I returned, has sufficed to show that they are indistinguishable in size, and extremely variable in both size and texture in either species.

14. LITTLE BROWN CRANE, *Grus canadensis canadensis* (Linnaeus).—At Camp B the first crane was seen on June 1, flying west up the valley, making a far-away piping call, *tinkerer, tinkerer, tinkerer*. . . . One or both members of a pair, presumed to have been the same two birds, appeared on June 8, 17, 20, and 25. On the last date they passed overhead five times, evidently engaged in their courtship flights. When they appeared at 10 a. m. they circled close overhead, and then planed majestically away for a couple of miles without beating a wing; one was calling *choo-r-r-oo*, owl-like and far-carrying. They flew almost wing to wing, one slightly ahead; sometimes they raised and lowered their heads, and once together lowered their feet.

Unfortunately they did not remain to nest, as had appeared to be their early intention, and they were never seen thereafter. Brown Cranes appear to be very uncommon in Baffin Island at the present time, the few recent records all coming from Pond Inlet and Bylot Island (Hørring, 1937: 46; Bray, 1943: 517).

15, 16. RINGED AND SEMIPALMATED PLOVERS, *Charadrius hiaticula hiaticula* Linnaeus and *Charadrius h. semipalmatus* Bonaparte.—Previous knowledge of the ranges of these two forms indicates *semipalmatus* as the type found throughout south, central, and western Baffin Island; *hiaticula* has been taken in recent times only at Arctic Bay (Bray, 1943: 518), Pond Inlet (Soper, 1928: 103), and Clyde Inlet (Dalgety, 1936: 585), all in the north and northeast. In Kumlien's time, 70 years ago, both forms were found by him breeding in Cumberland Sound, *hiaticula* being "apparently more common" (1879: 83), though Soper found only *semipalmatus* in that and other regions of southern Baffin Island in 1923 to 1931.

It was with interest that we examined the first two Ringed Plovers obtained at Camp B on June 26 and found them to be *hiaticula*. Another was shot on June 30, and a fourth on July 7. All these were in the same general locality, and all were males judged to be non-breeders.

Two plovers collected on July 12, after they had put on a decoy display, at another place about one and a half miles up the river, turned out to be *semipalmatus*; a second group of these was located on July 18 not far away. There Anderson found two chicks in down on July 26. This is our only direct evidence of breeding; prolonged search on the *hiaticula* grounds revealed no nests, and none of the eight specimens of *hiaticula* collected had brood patches or enlarged gonads. However, Anderson was decoyed by a plover, with fanned tail and trailing wing, on the *hiaticula* ground on

SPECIMENS OF *Charadrius h. hiaticula* TAKEN AT HEAD OF CLYDE INLET

No.	Sex	Wing length in mm.	Rectal temperature in degrees C.	Date
A 30	♂	126	42.3	June 26
31	♂	130	42.3	June 26
40	♂	129	39.3	June 30
46	♂	128	41.4	July 7
51	♀	128	39.8	July 14
52	♀	134	41.4	July 14
53	♂	130	41.8	July 14
54	♂	129	40.5	July 18

Mean 129.3

SPECIMENS OF *Charadrius h. semipalmatus* TAKEN AT HEAD OF CLYDE INLET

No.	Sex	Wing length in mm.	Rectal temperature in degrees C.	Date
A 48	♂	124	—	July 12
49	♀	122	39.1	July 12
55	♀	123	39.2	July 18
56	♀	123	—	July 18
59	♂	120	39.2	July 21

Mean 122.4

July 18, and our first encounter with the plovers on the *hiaticula* grounds, on the evening of the day we arrived at Camp B (May 24), was to watch the courtship chase of a pair, which continued for 20 minutes while the birds flew back and forth a few feet above the bare gravel flat, keeling over from side to side. One of them flew 10 meters behind the other, and one kept up the low piping "song," *tchu-ka, tchu-ka, tchu-ka* . . .

The proportion of non-breeders was high among *semipalmatus* also. The evidence indicates that the areas occupied by the two species, though ecologically indistinguishable and extending to several hundred acres in each place, were perfectly distinct. Eight specimens from the flats at the head of the inlet and adjacent Caribou Valley were all *hiaticula*; five from the terraces on both sides of the river one and a half miles west were all *semipalmatus*.

Salomonsen (1950: 184) has pointed out that in *hiaticula* there is a size-cline, diminishing to the northwest. Wing-measurements given by him for the Greenland population average 128.87 mm., compared with 129.3 in our series—a close agreement considering the small number measured in our case.

C. h. semipalmatus is a considerably smaller bird, with a narrower black breast-band and generally less white on the head, secondaries, and tail. (Witherby's

usually authoritative and accurate 'Handbook of British Birds,' 4: 354, 1940, gives a detailed description of *semipalmatus* which by no means applies to summer adults. In the latter, several of the alleged differences from *hiaticula* do not hold, and in fact the birds are more alike in color pattern than is there suggested.) These differences are barely sufficient for field-identification and, after many years experience of both birds, I can detect no voice-differences, for example, in the well-known, soft call *tooi*, and the series of grating and nasal notes, which seem common to both. There is no sign of hybridization or intergradation, however, and individuals of all ages can immediately be identified in the hand by the clear-cut difference in the amount of webbing between the toes.

The situation presented by these two birds, occurring in about equal numbers at the head of Clyde Inlet, is an interesting one. Normally allopatric and very properly regarded as subspecies, their formerly distinct ranges have evidently come to overlap in Baffin Island, as a result of post-glacial extensions of range by both Old and New World stocks. It appears that the birds can recognize members of their own race; each race avoids the other on the breeding grounds, a situation which might quickly arise through selection if mixed matings are infertile. They behave in fact as distinct species, and return of course to winter quarters separated by the Atlantic Ocean. The question of competition in their arctic home is a matter deferred for later discussion.

The gizzard of A40 (*hiaticula*) was crammed full of insect remains, including at least a dozen of a carabid beetle, *Pterostichus* sp., and one fritillary butterfly, *Boloria freija*. In A46 there was little recognizable, other than a few remains of the same beetle.

17. BAIRD'S SANDPIPER, *Erolia bairdii* Coues.—This, the only breeding sandpiper found by us, was a common bird both at Clyde on the coast and at the head of the inlet. The first migrants arrived at Camp B on June 6. Calls heard included the soft *twee-e, twee-e*, with a rising inflection, which gives the bird its Eskimo name, and a reeling trill suggestive of a cricket or cricket-frog, e. g. *Pseudacris nigrita*. This trill was heard on only two days (namely on June 14 at Camp B, and repeatedly on the 17th at Clyde) in spite of the constant presence of a breeding pair within a few hundred yards of our tents. There was also a harsh screeching during the distraction display.

We had at first no success in finding nests, but succeeded on July 10 in finding, first, two lately-hatched chicks, and later, in another place, a nest with three chicks and an unhatched egg. The nest, on a grass tussock containing prostrate willow-stems, was a slight depression lined with dead leaves of *Salix arctica*. The site was moist and well covered with herbage, on the fringe of the pond area of the "East Flats." The egg and the chicks were very beautifully marked, the black, buff and tawny speckling of the latter suggesting the color combination of a fritillary butterfly. All five chicks were banded.

At the same place the following day one bird put on a vigorous distraction display, screeching and trembling with the wings arched, and all the feathers raised. Four others flew around together meanwhile. On July 17, Anderson caught an unbanded chick close to the same place, and was greeted with another very similar display.

Pairs were found occupying sites not only on the wet flats, but also on the slopes and terraces up to say 60 meters, always where there was moist ground and fairly continuous vegetation.

A male collected on July 10 had brood-patches and was beginning to molt. Body temperature was 42.0° C. This bird had had the tibio-tarsus of one leg broken and

healed; it was very fat beneath the skin on the breast and back and in the body cavity. Its stomach contained fine insect remains. On August 7 Anderson watched one bird, in company with two Ringed Plovers, taking small flies washed up in a windrow on the strand near the river mouth.

18. WHITE-RUMPED SANDPIPER, *Erolia fuscicollis* Vieillot.—A party of five was seen by Anderson at Clyde on September 3.

19. PHALAROPES, *Phalaropus* sp.—Unidentified phalaropes were seen in Davis Strait by me on August 8 and 11, 1937, in the waters off Frobisher Bay and Hudson Strait, and by Anderson in Admiralty Inlet on September 8, Lancaster Sound on the 9th, and in Frobisher Bay on the 13th, 1950.

About 2:30 a. m. on June 16, when flying southeast along the sea-shore, which served to guide us between Capes Eglinton and Christian in thick weather with a ceiling at 30–60 meters, we met head-on flock after flock of northbound shore-birds of phalarope size, navigating along the coast like ourselves in the thin clear stratum between the mist and the ground.

20. POMARINE JAEGER, *Stercorarius pomarinus* (Temminck).

21. PARASITIC JAEGER, *Stercorarius parasiticus* Linnaeus.

22. LONG-TAILED JAEGER, *Stercorarius longicaudus* Vieillot.—Jaegers of all three species were seen by me in Baffin Bay off Hudson Strait and northward, August 8 to 11, 1937. In 1950 Anderson recorded *parasiticus* and *pomarinus* at Navy Board Inlet, September 7, and in Frobisher Bay on the 15th and 16th.

Jaegers, probably Parasitic, were seen on several occasions on July 12 by members of the expedition occupying the ice-cap station, 850 meters above sea-level and nine miles from "land" on the southeast lobe of the Barnes Ice Cap. Two or three were seen by Col. P. D. Baird at Bray Island, Foxe Basin, August 9 and 10.

23. GLAUCOUS GULL, *Larus hyperboreus* Gunnerus.—This was the only gull certainly identified in the Clyde region. We were not so fortunate as Dalgety (1936: 587) who twice saw single Sabine's Gulls on migration there, or Shortt and Peters (1942: 345) who saw one Sabine's Gull and several Kittiwakes.

The Glaucous Gulls arrived before us, although on May 22 when the first pair was seen there was no open water whatever, either in the fiord or the rivers. From May 26 onwards we saw them in ones, twos, or threes hunting along the course of the ice-bound Clyde at Camp B, though there can have been virtually nothing for them to eat during the succeeding 2 to 3 weeks.

On June 6 a solitary pair had taken up its position on a nest-ledge on the cliffs forming the west wall of Marble Canyon, about five miles up the Clyde River from its mouth. This was evidently a regular site, marked by an accumulation of guano and the lichen, *Caloplaca*, and some old egg-shells. Incubation was in progress there on July 3.

Sites containing one and two nesting pairs were found on south-facing cliffs a few miles down from the head of Clyde Fiord; the first of these on August 5.

There was a solitary nest on a boulder 6 meters high on the shore of Eglinton Fiord close to Eglinton Glacier. A single young bird fledged on August 23 or 24.

Riley reported small colonies of about 5 and about 12 pairs nesting near the heads of Gibbs and McBeth fiords. Eleven birds were noted in Inugsuin Fiord on September 5.

On the southeast side of Padloping Island, three to five miles east of the Meteorological Post, we saw on August 15 a colony of about 50 pairs on a 600-meter cliff, some of the nests being 300 meters up on the cliff. Several young were on the wing on that date. There was also a colony of over 20 pairs on Cape Searle Island on the

south side where begin the cliffs which run out to the cape itself; it is outside the limits of the Fulmar colony. A solitary nest was seen at the Lower Savage Islands and a colony on the cliffs just east of the entrance to York Sound, Frobisher Bay, on August 1 and 2, 1937.

The voice and calls of the Glaucous Gull resemble those of the Herring Gull, *L. argentatus*, much more closely than those of the Great Black-back, *L. marinus*.

24. KUMLIEN'S GULL, *Larus glaucoides kumlieni* Brewster.

25. HERRING AND THAYER'S GULLS, *Larus argentatus smithsonianus* Coues and *L. a. thayeri* Brooks.—No gulls of the *glaucoides-argentatus* group were found breeding in the Clyde region, nor at Padloping or Cape Searle. A scrutiny of the literature fails to reveal records of *kumlieni* on the coasts of Baffin Bay north of the entrance to Cumberland Sound (Soper, 1928: 83), or of *thayeri* south of Eclipse Sound (Milne Bay) and Pond Inlet (Hørring, 1937: 72). There seems in fact to be a gap of at least 500 miles without any gulls of this group on the east coast of Baffin Island. [Kumlien's statement (1879: 99) that '*argentatus*' 'breeds north to lat. 67° N.' has never been substantiated.] *L. g. kumlieni* is evidently a low-arctic race, the counterpart of *glaucoides* in Greenland; and the interval separating its range from that of the high-arctic and continental *thayeri* on this coast is greater than that separating *glaucoides* and *thayeri* on the opposite Greenland coast (Salomonsen, 1951).

On August 8, 1937, as we coasted the north shore of Frobisher Bay, a number of adult Kumlien's Gulls circled about the vessel from time to time, from Brewster Point to Lok's Land. The legs of these birds appeared a "rather deep color, perhaps brownish pink."

L. argentatus smithsonianus also occurs in Frobisher Bay; I identified one near Jackman Sound on July 28, 1937. Two dozen gulls of this group, adults and juveniles, seen by Anderson at Frobisher Bay Post on September 13 to 15, 1950, appear to have included ordinary Herring Gulls. Of the juveniles, however, he noted: "four of these look almost black at a distance, and rather like young herring gulls, but plumage is more contrasted, by means of black and slate-greys of the back, and whitish underparts." Kumlien (1879: 99) wrote of the gull William Brewster named after him, "full-grown young of this species were shot in the first days of September; these were even darker than the young of *L. argentatus*, the primaries and tail being very nearly black" (his italics). There is a certain correspondence between these two observations and, since no one but Kumlien has ever certainly identified a juvenile *kumlieni*, it might well turn out to be entirely different from *glaucoides* in this plumage. Hørring (1937: 70) found unexpected features also in the juvenal plumage of Thayer's Gulls from Melville Peninsula, including incidentally "far more mottled" back and shoulders than in the Herring Gull, again recalling Anderson's description. Future travelers should pay particular attention to these September young birds.

Regarding *thayeri*, Anderson observed a few from the C. D. HOWE on September 7 to 9, 1950, in Lancaster Sound, and a juvenile "with dark secondaries and primaries, uniformly mottled all over," was seen at Arctic Bay. There is finally the bird seen by Anderson at the head of Clyde Inlet on July 31, "like a herring gull, the black wing tips quite noticeable, seen near glaucous gulls." This is more likely to have been *thayeri* than *smithsonianus*. It is not impossible that in a year of abundant lemmings Thayer's Gulls might prove to be numerous in the Clyde region.

26. KITTIWAKE, *Rissa tridactyla tridactyla* (Linnaeus).—Kittiwakes are numerous, especially offshore, in Baffin Bay and Davis Strait in August and September, but no breeding stations are certainly known on the Baffin mainland. Freuchen (Hørring, 1937: 65) found them in association with mures and Sabine's Gulls at Button Point,

Bylot Island. J. C. Ross (1835: xxxv) states that they breed "in inconceivable numbers" along the west coast of Prince Regent's Inlet, which means, I think, Somerset Island and not Baffin (Soper, 1928: 82; and Bray, 1943: 529). Bray was told by an Eskimo, however, of "white gulls with black legs" nesting in enormous numbers in the interior of Brodeur Peninsula and on the cliffs in Port Bowen region.

It is thus interesting to record that a small colony of a hundred nests or so was passed on the port hand as we entered Acadia Cove, Resolution Island, on July 27, 1937.

27. ARCTIC TERN, *Sterna paradisaea* Pontoppidan.—The writer has not seen the Arctic Tern in Baffin Island. However, Col. Baird's party which visited Bray Island, Foxe Basin, by airplane on August 9 and 10, 1950, found them in plenty. Riley and Eade reported finding about 20 terns on August 31, 1950, at the mouth of a small river entering Clyde Inlet, 15 miles southwest from the Post at Clyde. Dalgety (1934: 587) found terns fairly numerous on the rivers and lakes round Eglinton Fiord, but I spent eight days there at exactly the same date (August 20–27) in 1950, and undoubtedly visited the same lakes, without seeing any sign of them.

28. BRÜNNICH'S MURRE, *Uria lomvia lomvia* (Linnaeus).—We saw an immense number of Brünnich's Murres in the waters around Padloping Island and Cape Searle on August 15 to 18, 1950; many carried a silver capelin in their bills as they flew swiftly homewards to the southeast. It was a disappointment to find that they did not nest at Cape Searle, but instead on a distant headland in the vicinity of Reid Bay, 15 or 20 miles southeast, according to the Eskimos. There must be a very large colony there. I understood the place to be on the large island in the mouth of Reid Bay, marked (as a peninsula) on Boas' map as "Agpan," which means the murre-place.

Kumlien (1879: 105) mentions large breeding-places in Exeter Sound and about Cape Walsingham and Cape Mercy.

On August 8, 1937, we passed some 25 miles off Monumental and Lady Franklin islands and noted a large number of murres coming and going, as Kumlien did in the same region "about Grinnell Bay." Evidently no colony is situated on Lady Franklin Island, because Kumlien, as is well known, passed close enough to it to be able to report (erroneously, as is now universally believed) that the Great Skuas "had young ones on the rocks"; he would certainly have mentioned any breeding murres. Many murres were seen by us that day along the north side of Frobisher Bay, and they were especially numerous off the southeast coast of Lok's Land.

On July 27, when off Acadia Cove, hundreds were seen proceeding to and from Hatton headland, the southeast point of Resolution Island. They would have been obliged to round the headland in order to reach a colony somewhere on the east side of the island. Soper (1946: 238) had reason to believe that breeding places might exist there.

29. DOVEKIE, *Plautus alle* (Linnaeus).—Large numbers of Dovekies were seen off shore in Baffin Bay by Anderson, "in parties of 5–10 as far as the eye can see," immediately outside Clyde Inlet (September 5, 1950) and between there and the entrance to Pond Inlet; again in Eclipse Sound (7th), Lancaster Sound (9th), and southward to Davis Strait (lat. 65° N) on September 10 to 12 (Shortt and Peters, 1942: 346). On August 9 and 10, 1937, I saw small numbers (about 20 in all) in summer plumage in Davis Strait in about lat. 64° N.

Anderson was informed by Father Daniello of Pond Inlet that Dovekies breed near the murres, but in smaller numbers, at Cape Graham Moore, southeast Bylot Island. Freuchen visited the bird-cliffs north of Button Point, which is evidently the same

location, in August, 1922, and again in July, 1924, but makes no mention of having seen Little Auks there (Hørring, 1937: 92-93). There are other murre colonies on the east coast of Bylot however, and it would not be unexpected if Dovekies were to be found in them, as well as on Devon Island. No breeding places are certainly known, and no specific sites in Canadian territory have even been suspected up to the present.

30. BLACK GUILLEMOT, *Cepphus grylle* (Linnaeus).—At Savage Harbor, Lower Savage Islands, on August 1, 1937, we found a considerable colony, of the order of 100 pairs, nesting in low cliffs. Many were carrying food to their young.* A colony of the same size, together with Glaucous Gulls, was seen on August 15, 1950, some five miles northeast of the Meteorological Station on Padloping Island, and there were a few on the water below the cliffs of Cape Searle.

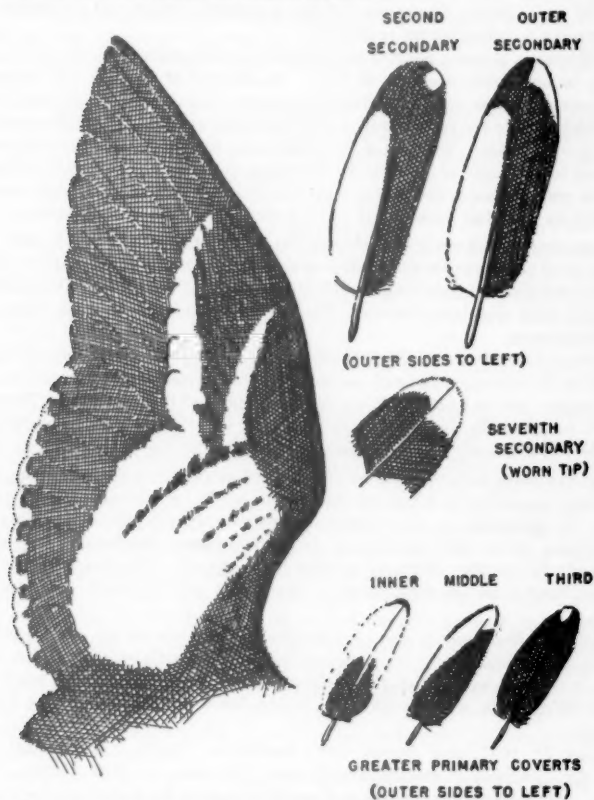


FIGURE 1. *Cepphus grylle*: left wing and feathers from right wing of "extreme *mandtii*" female in first summer (one year old), Brewster Point, Frobisher Bay, Baffin Island, August 7, 1937.

Riley and Eade, who traveled largely by canoe after the fiord ice disappeared, reported seeing occasional Black Guillemots in Gibbs, Sam Ford, and McBeth fiords, all in the Clyde region, in July and August, 1950.

A male and female collected at Padloping agree, within the wide limits of common variation, with fresh specimens studied by me in 1937 in Frobisher Bay and northern Labrador and fall between *mandtii* and *atlantis* into what is now usually called *arcticus*. The Padloping specimens measure: ♂—culmen, 25.5; wing, 156 mm.; ♀—culmen 24.5, wing, 158 mm.

The following paragraphs are adapted from my report to the National Museum of Canada, 1937.

None of the specimens examined in northern Labrador and Frobisher Bay was typical of *atlantis* or *mandtii*; in fact, as shown by specimens collected for Bowdoin College by J. R. Forbes during our voyage, a complete range of intergrades exists there, forming a heterogeneous population.

The differences between *atlantis* and *mandtii* are recognizable in the field in summer only in immature one-year-old birds. In *mandtii* at this age the secondaries have prominent white tips, like those present in most other alcids; these form a narrow white bar on the closed wing, behind and separate from the white wing-patch, and easily seen in life. The tips of the greater and median primary coverts are also white, and increasingly so towards the innermost ones, which are mostly white; this is likewise conspicuous in the bird in flight (see Fig. 1). These extra white markings are lacking in the adult *mandtii* and in both the immature and adult *atlantis*.

Four specimens of this age were obtained at Brewster Point, August 7, 1937. The one nearest to *atlantis* showed no white at all on the tips of the secondaries; the two nearest to *mandtii* had large oval white "mirrors" at the tips of the inner vanes; and the fourth bird was intermediate. The extremes embrace a most conspicuous range of variation.

Other variable characters both in juvenal and mature plumages include the amount of black on the concealed bases of the white secondary coverts, and the extent of the white tongues, visible from below, on the inner vanes of the primaries. These were found to be generally correlated, so that a bird with longer white tongues on the primaries has a shorter, narrower, dark stripe along the shafts of the white coverts.

The above notes were written without regard to the more recently accepted nomenclature, according to which all these birds would be included in *arcticus* C. L. Brehm. It appears to me that certain reservations are called for in applying a sub-specific name to so heterogeneous a population, many members of which could individually be ascribed either to *mandtii* or to *atlantis*. The taxonomic situation presented bears a certain resemblance to that of the Horned Larks, described below (p. 375).

31. *PUFFIN, Fratercula arctica* (Linnaeus).—Puffins seen in the coastal waters of northern Baffin Island may be presumed to come from Greenland, and such may have been the case with the single individuals observed by Anderson at sea from the *C. D. HOWE*, north of Bylot Island on September 9, 1950, and off Cape Adair the next day.

On July 27, 1937, near Acadia Cove, Resolution Island, I saw a single Puffin among the hundreds of murre coming from and going to their distant breeding stations. On making inquiries ashore I was informed by the R.D.F. station operators that there was a "considerable" colony of Puffins on the east coast of Resolution Island. This report may turn out in the end to be unfounded, and must for the present be regarded with reserve, although it certainly deserves investigation. If there is a

colony on Resolution Island, then it is almost sure to be small, and certainly very isolated; the most northerly one seen by me in Labrador was a very small one at Akpalik or Tinker Island, near Davis Inlet, 55° 57' N, over 300 miles to the south; at the time I saw the latter (August 21, 1937) some 200 Razor-billed Auks were present, and only 10 to 20 Puffins were seen.

Anderson saw a Puffin off Hudson Strait on September 16, and Kumlien (1879: 103) says he observed the species "northward to Hudson's Straits."

32. SNOWY OWL, *Nyctea scandiaca* (Linnaeus).—No owls were seen until August, when breeding was presumably over, and the birds on the move. There was one at Clyde on August 13; and the following day, as we flew south over the broad low-lying foreland of Cape Hewett, between Clyde and McBeth fiords, three solitary white owls were seen, 300 meters below, quartering low over the ground, rocking from side to side as they flew in the characteristic manner, which makes it possible to identify the Snowy Owl almost as far away as it can be seen. These coastal barrens are evidently a preferred habitat; Dalgety (1936: 383) saw two owls at Clyde on August 28, 1934.

33. HORNED LARK, *Eremophila alpestris hoyti* \times *alpestris*.—The first Horned Lark was not seen until June 6, two weeks after our arrival at Camp B. Towards the end of the month they had become moderately common, and conspicuous on account of the wide-ranging song-flights of the male.

SPECIMENS OF HORNED LARKS

No.	Locality	Date	Sex	Culmen	Wing	Color of face
A 41	Head of Clyde Inlet	30 June	♂	13.0 mm.	110 mm.	extremely pallid
58	Head of Clyde Inlet	21 July	♂	12.5	115	medium yellow
69	Head of Clyde Inlet	1 Aug.	♀	11.5	105	very yellow
50	Head of Clyde Inlet	12 July	Juv. ♂	(not full-grown)		

In the population there was a complete mixture, in so far as the intensity of yellow pigment on the face is concerned, between birds having a white eye-stripe and forehead and the faintest suggestion of yellow on throat, and those described as "very yellow on the face, no different from *alpestris*." In fact, the experiences of Soper (1928: 109 and 1946: 418) in southern Baffin Island were exactly duplicated, even to the predominance of pallid types. In my field notes there are references to the facial coloring of 13 individuals, 9 of which were "pale" and 4 "yellow." Only three adult specimens were collected, and these include a moderately yellow and a pallid male, and a very yellow female. The length and breadth of the bill, the extent of whitish coloring on the outer tail feathers, and the color of the feathering of the tibiae exhibit equally wide variation in our specimens, the whiter face being correlated with much more white on the outer tail feathers and pale buff (rather than pinkish-brown) tibial feathers in the pallid male. The finest and sharpest bill, however, is that of the other, yellower male.

Mating was apparently random, for both mixed and similar pairs were found, and intergradation was continuous.

This admixture of racial types appears to be found over two-thirds or more of the immense area of Baffin Island, and to reappear again at Churchill, Manitoba (Taverner & Sutton, 1934: 63, and Bent, 1942: 323). North of Churchill, from Eskimo Point north to Chesterfield, Baker Lake, Southampton Island, Melville Peninsula, and westwards, the breeding form is generally nearer to *hoyti* (Hørring, 1937: 109; Bray,

1943: 531-532; and Sutton, 1932: 211-218); throughout Ungava and Labrador it is *alpestris* (Manning, 1949: 203).

The pressure of selection on the different variable characters of the hybrid population does not appear to be rigorous. The present situation has possibly arisen from the recent expansion of the ranges of the two subspecies, formerly separated (perhaps by Hudson Bay), which has given them equal access to some of the same areas; in the absence of barriers to reproduction and of adaptive differences leading to competition, they have produced a hybrid swarm. It is interesting to compare this case (and possibly that of the Black Guillemots) on the one hand, with those of the Ringed Plovers, already mentioned, and of the Red-polls on the other. The historical antecedents are no doubt basically the same in all, but in these latter cases the development of reproductive isolation has caused forms, elsewhere recognizable as subspecies, to behave with full specific independence; whereas in the larks (and guillemots?) two forms elsewhere distinct are here united into a single population.

Horned larks at the head of Clyde Inlet were distributed not only over the lower ground but also on the plateaus up to 750 meters, above which the snow probably lies too extensively through July. They appeared on the high ground as early as June 14, when it was impossible for us to travel without skis and there were few bare patches and no new growth of vegetation. They were generally very shy and unapproachable. A number were heard singing on June 9 by the Pipit Lakes, flying about at a considerable height, repeating over and over the staccato flinty song. It consists of about eight notes, quickening in pace and finishing on a very high note, the whole being repeated at five-second intervals; the wings are held motionless during each emission of song. During their song-flights the birds often wander many hundreds of meters. On the night of June 23-24 we noted a lark in song at midnight, following a lull during the previous hour. Song had almost ceased by July 11, though one cock was heard to sing on July 26. They very frequently sing on the ground.

On July 1 one was observed collecting food, and on the 7th we found a nest, situated on an almost bare gravel-covered clay flat in the outwash fan of Caribou River. On one side of the nest were a few plants of *Epilobium latifolium*, arctic poppy, and grasses, and on the other (bare) side a broad rampart of loose tufts of *Cetraria* and balls of clay, such as might be seen surrounding a Prairie Horned Lark's nest. The nest was of dry grasses and dry leaves of *Potentilla pulchella* and contained five eggs.

On July 8 an adult was found feeding a young bird already able to fly; on the twelfth in another place a juvenile was collected in the same circumstances, and on the thirteenth Anderson found three young being fed. As late as July 29 a young bird was seen still unable to fly. (As is well known, the young of Horned Larks, as well as those of Skylarks and probably other species, may leave the nest several days before they can fly.)

Horned Larks were observed on the coast at Clyde on various dates from August 12 to September 4, when we left; they were noted at Frobisher Bay Airport from September 6 to 14. None was seen in the Frobisher Bay area in July and August, 1937. On August 13 and 19 at Clyde, larks were observed eating the seeds of the small grass *Puccinellia phryganodes*.

34. NORTHERN RAVEN, *Corvus corax principalis* Ridgway.—The raven was absent as a nesting bird from the head of Clyde Inlet, though we were visited by one or two birds on nine different dates during the 80 days of our residence at Camp B. They seem to have been scarce throughout the whole region; there were none at Clyde Post until August, when three appeared and lived as scavengers at the

settlement. They were plentiful at Frobisher Bay Airport, where a dozen could sometimes be seen at the garbage dump.

In 1937 one or two ravens were recorded at York Sound, Brewster Point, and Savage Harbor.

35. GREENLAND WHEATEAR, *Oenanthe oenanthe leucorhoa* (Gmelin).—At the head of Clyde Inlet the wheatear was certainly more abundant than anywhere else in Baffin Island for which records exist. I was with Forbes (1938: 492-495) at Brewster Point, Frobisher Bay, where we saw 12 wheatears in two days, 9 or 10 of which were all associated with one nest, as described below. At Camp B, however, twice that number could very easily have been seen, and within our regularly frequented ten square miles there were of the order of 20 breeding pairs.

A male was found singing on May 25, the day after our arrival, but it had possibly only just arrived, for no others were seen until the 29th. A pair was seen on the 30th. We had the misfortune to catch in a lemming-trap the female of one of the two pairs nearest our camp, and were unsuccessful in finding the nest of the other pair, on the slope beneath the falcons' cliff, until they were feeding young on June 29.

The spirited singing of the males was superior in quality, and more persistent in output, than that of the typical *oenanthe* in Britain. They sang almost always in flight, our best-known cock starting very often by rising from a boulder on top of a rocky ridge, and dropping slowly down 50 meters to the meadow below; the tail is fanned out, and the wings planed or flapped in "slow motion" as it sings. The song has great variety and continuity; one continuous burst was timed for 27 seconds. The rapid warbling phrases have some qualities of the Skylark's, mixed with harsh chatter-notes, reminiscent of the House Wren, *Troglodytes aedon*, or Sedge-Warbler, *Acrocephalus schoenobaenus*. The song-period lasted until July 12; in June it might be heard throughout the 24 hours.

In Britain the ordinary call-note is the well-known *weet-chack, chack*, and we remarked with surprise that for seven weeks we did not hear this call at Camp B, though we saw wheatears every day. The alarm notes were *see-lu*, or *ze, ze, ze*. But on July 12, the day we found the young birds gone from the nest, we heard for the first time the *weet-shack* alarm call, which the female kept up continuously.

The relations of the adults to one another are at times puzzling, but could be explained in part by the presumption that there is a considerable excess of males. The cock mentioned above as losing its mate in a trap on June 7 never attracted another, though it sang for an additional three weeks. Of the five adult birds collected by Forbes and me at Brewster Point in 1937, no less than four were males, as were also both the fledglings collected from the nest.

On June 25, I watched a cock displaying to an almost motionless hen on a large boulder. He stood bobbing the tail up and down, from time to time making a quick curtsey by flexing the tarsal joints. At the same time, within a couple of feet, another male sat as an interested onlooker. The second male, incidentally, had a much brighter and more rosy brown breast than the first.

The nest found on June 29 was in a chamber underground between small boulders, the entrance between the stones being just large enough to admit the hand but not the arm. The boulders were largely overgrown with turf, and the situation as sheltered and sunny as could be found, on the slope below the Gyrfalcons' cliff. Both parents were busy flycatching to feed the young, of which four could be counted, appearing to be several days old. The young were still in the nest on July 10,

but on our return on the 12th, hoping to band the fledglings, we found nothing but the anxious parents and concluded that the nest had been found by a weasel.

When this nest was collected on July 25 for examination and collection of nest-parasites, the remarkable fact was disclosed that it had been used this year for the eighth time, having eight clearly distinct layers and linings. Feathers, of which there were numbers scattered everywhere near by, from the falcons' prey, constituted about 40 per cent of the bulk of the material, vegetable matter (dry grasses, willow leaves, etc.) 40 per cent, hare and lemming wool (and a piece of new red darning wool), and miscellaneous matter including pieces of crushed egg-shell, constituted the remaining fifth.

The re-use of the nest is a habit, perhaps developed in adaptation to the short breeding season and the urgency of getting started, to which reference will be made again under the redpolls and longspur.

As an indication of family size, broods of flying young accompanied by, or being fed by, one or both parents were seen from July 26 to August 11, and numbered 1, 2, 2, 3, 3, and 3. The one nest, as just mentioned, appeared to contain four nestlings, as did that found by J. R. Forbes (*loc. cit*) at Brewster Point on August 6, 1937.

When Forbes took me to the latter nest that evening there were two (possibly three) young still in the nest and two on a little ledge just outside it. There were probably six full-grown birds in attendance; five were seen together at one time, and, in addition to the two "parents" which were present, four birds were collected the next morning, all molting from juvenal to adult plumage. Two of the latter were actually seen to feed the nestlings, and probably all were doing so. Nicholson (1930: 306), in the last week of July, found three or four birds trying to feed nestling wheatears at the head of Godthaab Fiord, West Greenland, and he concluded that this particular pair was raising a second brood, while still accompanied by the young of the first—an explanation which perfectly fits the circumstances of our case also, and may be readily accepted. At Camp B there were no indications of double or late broods in 1950, and the phenomenon is probably not very common. The simple statement "double-brooded" in Witherby (vol. 2: 150, 1938) under Greenland Wheatear is presumably based on Nicholson; it might be modified, at least for Baffin Island, to read "usually single, but apparently sometimes double-brooded."

The wheatears were the only passerine birds to leave the country before we did. About July 20 we noticed that they seemed to have become scarce, possibly a pre-mature impression resulting from the molt which would keep them subdued and secretive; but the last seen by either Anderson or me was on August 11.

36. AMERICAN PIPIT, *Anthus spinoletta rubescens* (Tunstall).—Bent (1950: 35) includes Arctic Bay and Pond Inlet in the breeding range of the American Pipit, but prior to this Dalgety's mention (1936: 582) of it, as "the commonest bird" in August at Ravenscraig Harbor, 32 miles northwest of Clyde, was the most northerly published record in Baffin. Bray (1943: 532-533) observed pipits north to Fury and Hecla Strait and inferred that they bred in Cockburn Land (Baffin Island). None were recorded by the Fifth Thule Expedition anywhere north of Danish Island (Hørring, 1937: 113).

We noticed their absence from the coastal lowlands at Clyde Post during the breeding season, though they appeared there on migration in late August and early September.

At the head of Clyde Inlet pipits were unexpectedly abundant. The earliest migrant was a male found singing on May 27, and this being the notable event of

the day to us, we called the nearby lakes the "Pipit Lakes," and later extended the name to the "Pipit Hills" and "Pipit Point" beyond. On June 1 at least eight cocks were heard singing, in a walk of five miles. Thereafter pipits stood third in order of abundance of the birds at Camp B, the longspurs and Snow Buntings alone exceeding them. They were most plentiful on the lowest slopes, but were observed singing as high as 825 meters on Dyke Mountain. (Late in August while climbing Eglinton Tower I disturbed several resting at about 900 meters, where the ground was composed of clean exfoliated slabs of rock covered by a few inches of new snow. They were quite possibly on migration.)

Pipits are most at home on rather steep, but not necessarily high, slopes, either somewhat stony or wholly turfed over; they do not nest in flat country. The site is chosen so as to be overhung by a roof of stone or vegetation, and according to Pickwell (1947: 8) may be excavated to some extent by the birds themselves.

Nest 1, overhung by *Cassiope tetragona*, was found on June 13, when it contained six eggs. Neither the parents nor the nest could be found on our next visit, and we presumed that it had been robbed by a weasel, one of which was hunting within a few yards of it on our first arrival, or perhaps by a fox.

Nest 2, also overhung by *Cassiope*, and containing seven eggs, was found on June 22; it was not revisited.

Nest 3 was about 300 meters above sea-level, in a gully near a small stream on the south slope of Dyke Mountain. When discovered on June 23 it was recorded as containing six eggs; subsequent visits showed five eggs on June 30 and July 3, and young on July 13.

Nest 4, somewhat lower on the same slope, contained four eggs on June 23 and five on the 25th. Something displaced our markers and it was not subsequently relocated.

Nest 5, about 30 meters above sea-level, and overhung by *Cassiope*, contained seven eggs on June 25, and the young on July 4 were about three days old. When I went to band them on July 11 only four were left, and they "exploded" out of the nest but were safely replaced.

A sixth nest was found at 400 meters on Dyke Mountain on August 11, overhung by *Cassiope* and *Ledum*; it was empty.

Without exception these nests faced between southeast and southwest. Clutches known to be complete contained 5 (? 6), 7, and 7 eggs.

(Two other nests found in former years were at Komaktorvik, North Labrador, on July 19, 1937, containing two young just hatched and four eggs; and on Mount Albert in Gaspé, Quebec, on June 26, 1932, containing five eggs somewhat incubated.)

Our notes show that in the week following July 4 a great many pipits hatched, and parents carrying food were to be seen everywhere. (An adult collected on June 30 had fed on *Tipula arctica* and other insects.) From about July 16 to 23 the majority were ready to leave the nest, and there is some evidence for believing that, like the Horned Larks and longspurs, the young pipits do so before they can fly. On July 16 Anderson found one in the grass being fed by its parents, and he was easily able to catch and band it; the following day he came upon six barely able to fly and squatting on the ground.

Few pipits were to be seen around Camp B in August; the birds were possibly moving off as soon as the molt was completed. A female shot on August 9, but not preserved, was in wing molt.

Measurements of five specimens, all from the head of Clyde Inlet, are given below:

No.	Date	Sex	Temp.	Wing	Culmen	
			degree C.	in mm.	in mm.	
32	June 27, 1951	♂	40.3	83	12	Spots on breast large and conspicuous.
38	June 30, 1951	♂	37.8	86	11	Spots on breast very small
39	June 30, 1951	♂	39.9	87	11	Spots on breast scarcely visible
61	July 26, 1951	♂	40.3	86	11	Spots on breast large and conspicuous
65	July 29, 1951	♀	40.7	82	11½	Spots on breast numerous, not quite so large as in No. 32

All the above have more or less of a distinct notch on each edge of the upper mandible about one millimeter from the tip. Numbers 38 and 39 were in very fine plumage, with the breast almost immaculate. The legs of all the males were black, and those of the single female brown-black.

Small numbers of pipits were seen quite frequently at the head of Eglinton Fiord, August 21 to 27, including one party of six. They were noted on June 4 and 28 by Riley at Gibbs Fiord. In 1937 they were found in small numbers wherever we went ashore in Frobisher Bay, namely, Resolution Island, Savage Harbor, York Sound, and Brewster Point. Pipits were seen on Frobisher Bay Airfield on September 6, 1950.

37. *HORNEMANN'S REDPOLL*, *Acanthis hornemanni hornemanni* (Holbøll).

38. *GREATER REDPOLL*, *Acanthis flammea rostrata* (Coues).—These two species are treated together because they present the most interesting relationship to be found among the birds we studied. Measurements of specimens given below reveal that our populations do not differ significantly in size from those found in Greenland, and should be designated by the trinomials given above. In the succeeding pages, however, the specific names (*hornemanni* and *flammea*) alone have been used, because they are the most widely known and the least confusing.

The involved relations of the various forms of redpolls have provided a subject of discussion, and a puzzle, dating back at least to the publication of Coues' Monograph of the Genus *Aegiothus* . . . in 1861. Salomonsen (1928, 1951) adheres to the view that *hornemanni* is a mutant of *flammea* and that all redpolls belong to a single polymorphic species. *Hornemanni* and *flammea* may exist, he states, as allopatric geographical races, or allegedly in Iceland as members of an interbreeding polymorphic population or, again, they may overlap without interbreeding.

In fact, *flammea* extends further southward than *hornemanni*, and there are great temperate and even subarctic tracts of both New and Old Worlds where *flammea* alone is found as a breeding species. On the other hand, the northern limit of *flammea* extends well beyond the tree-line and is roughly coincident with the northern limit of *hornemanni*.

Almost everywhere that *hornemanni* is found, therefore, *flammea* is either mixed with it or is in more or less close proximity. This is true in Scandinavia and the valleys of Siberia (Swanberg, 1951: 14), western Alaska (Turner, 1886: 171-172, and later authors), Mackenzie delta (Clarke in Forsild, 1943: 34), southern Keewatin (Manning, 1948: 20-21), Churchill (Taverner and Sutton, 1934: 73-74) and York Factory (Preble, 1902: 118), Chimo (Turner, 1885: 239) and Baffin Island. Except northeast and northwest Greenland (Salomonsen, 1951: 516-517) I am not able to cite any considerable region where *hornemanni* is found alone.

This and certain additional facts, namely, that the two species habitually flock together from August to June, and that the song, call-notes, nests, eggs, and food are indistinguishable (to me at least), are most easily explained by supposing the two types to be forms of a single dimorphic species. But this explanation seems to fall to the ground on account of other considerations: namely, (1) that the two differ not in one but in a number of plumage and structural characters; (2) that their geographical variation is not exactly parallel; (3) that the relative proportions in which they occur in any plane (*e. g.* Churchill) are subject to much variation from year to year (Grinnell, 1943: 156); (4) that they have never been shown to interbreed although Salomonsen (*op. cit.*, p. 518) actually shot a mixed pair in copulation in west Greenland; and (5) that over much of the range intermediates or hybrids are rarely found. Stejneger (1885: 259) says: "I have . . . handled about two hundred and twenty specimens of both forms, and among the whole lot there was hardly more than one specimen the identification of which gave any serious trouble, that being an adult male with red breast, and showing intermediate features suggesting its probable hybrid origin." It is in fact the almost universal opinion of taxonomists, Salomonsen being the notable exception, that *flammea* and *hornemanni* are distinct species.

It was our experience in Baffin Island that all birds, even in juvenal plumage, could be identified in the field, under normally favorable conditions, without difficulty, *flammea* being always much more "saturated" and coarsely streaked than the corresponding plumage of *hornemanni*. The red of the cap, and of the breast and rump of the male, varies very much, from a shade with more yellow, which might be described as coral or fiery red (or in some females even red-brown), to one with much less yellow, namely a carmine or crimson red; and my impression is that this reflects individual rather than specific physiological differences (as in, for example, *Carpodacus*, *Pinicola*, and *Loxia*). Under *hornemanni* I find, for example, the following field-notes: "♀; red crown is lighter in *hornemanni*" (July 7); "a ♂ the most brilliant I have ever seen; red on head and breast is more vermilion and less crimson than in [*flammea*]" (July 12); "♂ with deep carmine breast" (July 31).

The first redpolls seen at the head of Clyde Inlet were a pair of *hornemanni*, attempting coition on a boulder, on May 27. *A. flammea* was not of course expected, and not detected till June 9 when the erratic behavior of small groups of redpolls excitedly flying over the immense boulder-strewn slopes seemed so different from the quiet domestic activities of the nesting pairs of *hornemanni* previously seen, that we collected one and found it to be *flammea rostrata*. These birds were new arrivals which, to our surprise, shortly settled down to nest also.

Freuchen records (*in* Hørring, 1937: 113): "Ponds Inlet: 18.6.1924, 4 pairs breed here, all dark ones like those I observed at Milne Inlet." There are no other records of redpolls breeding in Baffin Island, and no actual nests have heretofore been found. During June and July at Camp B we located six nests of *hornemanni* and two of *flammea*.

Redpolls normally nest in trees or bushes, accepting mats of dwarf birch and willows, or occasionally grass tussocks (Grinnell, 1943: 157; Witherby *et al.*, vol. 1: 66, 1938). Our first nest, belonging to a pair of *hornemanni*, was found on June 6, perched in a small bracket-like notch near the top of a boulder and on its southwest corner, about two meters from the ground. The hen was on the nest which contained six eggs; only the Gyrfalcons were earlier than this in egg-laying at Camp B.

The body of the nest was composed of coarse materials, largely *Cassiope tetragona*, grass stems, and one piece at least of *Cerastium alpinum*, and the cup was lined

thickly with white Ptarmigan feathers. The outer materials struck me at the time as looking very gray and ancient, but it was not until later that we discovered that the redpolls, like the wheatears, use the same nest for a number of years. This accounts for the remarkable fact that a pair of birds which can barely have arrived before May 27 could have produced a nest complete with a full clutch of eggs in the course of ten days or less. Every one of the eight redpolls' nests mentioned had been previously used, and we found only one additional nest, unoccupied during 1950. Though I have not found this habit referred to in the literature, my friend, Dr. Jas. W. Campbell, informs me that a pair of Lesser Redpolls, *A. fl. cabaret*, relined a used nest and brought off a brood of young in it at Scatwell, Ross-shire, Scotland, in the spring of 1950.

Two other nests were found on hummocks formed by boulders more or less turfed over, one belonging to *flammea* and one to *hornemanni*. All the remaining nests, namely four *hornemanni*, one *flammea*, and one not in use, were in willows (always *S. cordifolia* var. *callicarpaea*), varying in position between the *Cassiope*-mat beneath the bushes, the base of the bush, and up to a height of 25 cm. The materials used were always much the same, except that in two cases seed-wool of *S. cordifolia* (of the previous year) formed an important part of the lining, and in one willow-roots were noted. All the nests were more or less conspicuous and easy to find.

The eggs of the two species are indistinguishable. Clutches known to have been complete numbered: *hornemanni*, 6, 6, 5, 5; and *flammea*, 7, 5.

Incubation is done entirely by the female. No precise determination was made of the incubation period, and in the only nest (*flammea* no. 2) watched with sufficient regularity there were still seven eggs on July 5, three were hatched on the ninth, four by the tenth, six by the eleventh, and seven by the twelfth. Hatching thus occupied a minimum of four days. In another brood (*hornemanni* no. 3) it was noted on July 11, "all hatched except one; young various sizes;" and of this brood one subsequently died (of suffocation?) on the twentieth, three left the nest on the twentieth, and two were still in it on the twenty-first. It is easy to understand that in this arctic climate the eggs must be covered from the time they are laid because the temperature in June is below freezing for much of the 24 hours. This will explain the considerable spread in hatching-time. The same spread was found to occur with the Snow Buntings and longspurs.

Out of 20 eggs laid, the subsequent fate of which is known with reasonable certainty, all hatched; one chick died just after hatching, one (mentioned above) died at fledging, and 18 fledglings left the nests. The fledging period is variable, with a minimum apparently of 10 days; 12 days is probably about the average. Towards the end of the fledging period nests on or near the ground may become fouled by a ring of accumulated feces; one blowfly hatched from a nest collected for examination. The nest becomes full to bursting also, on account of the number and size of the young. Flying young were first seen on June 25 (*hornemanni*), when a specimen was taken together with the female.

Obvious family parties were evident until the first days of August, and on the 11th Anderson noted that the young were already in various stages of molt, some beginning to show the red crown. A female taken on that date had also begun to molt. It may be noted here that the bills of both species, predominantly yellow or horn-colored in winter, become wholly or almost wholly dark in the breeding season and with the yellow correspondingly evanescent—a fact which, if understood, is not clearly stated in our handbooks; it finds a close parallel in the Snow Buntings. The bill of the juvenile is at first wholly dark also, but shows yellow after the August molt.

Except perhaps among carnivorous predators, competition between individuals for space and nourishment seems commonly to be reduced to a low level among members of the arctic flora and fauna; they live somewhat like weeds, the secret of whose success lies in their ability to exploit transient conditions while they last, in the absence of serious competition. In the Arctic the struggle for existence is overwhelmingly against the physical world, now sufficiently benign, now below the threshold for successful reproduction, and now so violent that life is swept away, after which recolonization alone can restore it. Populations of animals and plants there attain a frontier which ever advances towards the threshold of habitability, in the face of recurrent and more or less devastating set-backs. By much of the vegetation no "climax" is ever reached, but rather it consists of perpetual pioneers, compensated for their physical hardships by the absence of mutual competition. Among the animals, instead of the stable population held in check by density-dependent factors (predation, disease, demands for food or space), we find increasingly (and indeed characteristically) in high latitudes immense fluctuations in numbers from year to year, reflecting the impact of the physical environment, which is the immediate cause, upon the multiplication or recovery rate of the species concerned.

Where a surplus is locally produced, it may serve at once to expand the frontier, restock adjacent regions, or, in the more nomadic species, depopulated areas further away. There are certain well-known examples of wholesale, and ultimately destructive, emigration as immediate sequels to local or regional population excess, for example in the Rock and Willow ptarmigan, Brännich's Murre, the Dovekie, and the Scandinavian lemming. For these species emigration may serve as a check on the increase of population beyond a critical density. It should be noted, however, that emigration may also follow a failure of the food supply, as in the case of the Snowy Owl which, it is believed, appears in greatest numbers in southern Canada and the United States in winters following a sharp decline in the lemming population. Under the pioneering conditions of the Arctic these two causes appear to be perfectly distinct, and the Snowy Owl type of emigration may be confined to a few species of predators; but in the more densely populated subarctic and temperate environments population excess and inadequate food may be closely related and scarcely distinguishable causes of emigration. There is no reason to think that such vegetarian birds as ptarmigan and Willow Grouse, which feed on an enormous range of leaves, buds, stems, flowers, seeds and bulbils of abundant plants, ever over-eat their food supply, though circumstances may occasionally arise, such as exceptional winter ice-storms, which deny them access to it with disastrous results.

Like the plants of the tundra stone-fields, therefore, the population of certain birds such as redpolls, which undergo perpetual ups and downs, may never reach a density at which mutual competition for space actually limits reproductive success and further increase of numbers. In certain directions the pressure of natural selection may consequently be relaxed. Some such explanation is demanded in many parallel cases, either of extraordinary individual or local variability, evidently not rigorously selected about a single optimum type, or of the similar cohabitation of very close allies, such as the lemmings *Lemmus* and *Dicrostonyx*, or species for example among the butterfly-genera *Oeneis*, *Boloria*, and *Colias*, or among the plants *Salix*, *Draba*, and *Potentilla*. A number of arctic and alpine plants will flourish in temperate gardens, provided they are merely protected from competition; their natural distribution is curtailed more by their inability to face competition than by physiological restrictions. Some animal species may be very much the same. It is at least possible that where conditions do permit the population-

density to reach the threshold at which mutual competition is felt, then one of the competitors is able to supplant the other; and this could provide some explanation of the differences in range of *Lemmus* and *Dicrostonyx*, and of the absence of *Acanthis hornemannii* from the low arctic and boreal range of *A. flammea*.

39. LAPLAND LONGSPUR, *Calcarius l. lapponicus* (Linnaeus).—On the low ground at the head of Clyde Inlet the Lapland Longspurs were the commonest birds, and in the most suitable habitats, which are wet tussocky meadows such as those found in Falcon Hollow, they reached a density of one pair in 5–15 acres (2–6 ha.) They became rare away from the valley floor and lowest slopes; a male was noted at nearly 600 meters on June 24, but at no other time, and on August 3 several strays were seen at 250 meters in a place we had previously visited on a number of occasions throughout the season.

The first migrant, a single male, appeared on May 29; three days later the main body of males had arrived and a female was seen. Thereafter their songs became the best-remembered sounds of Camp B.

There was evidently a preponderance of cocks, and on one occasion three were seen attending a nest-building hen. Two could sometimes be found singing close together; and no sign of territorial disputes was observed, perhaps because the population was not sufficiently dense. The cock's normal behavior was to follow a human intruder a long way from the nest, for example, 250 yards or even quarter of a mile (200–400 m.) and as often as not, if we were making our rounds, into the vicinity of another nest. On July 5, in the height of the breeding season, I noted two male longspurs and one male Snow Bunting all on the same stone, and a few minutes later there had assembled near by another male of each species and a Greater Redpoll.

Eleven nests were found and of these ten were under more or less close observation. A summary of the information obtained can most conveniently be given.

The nests were usually to some extent concealed by the surrounding vegetation, composed predominantly of grasses, together with some leaves, and lined with a few feathers of ptarmigan and sometimes of longspur; one nest had also some wool of willow seeds and of arctic hare. One of two nests broken up after use, in order to be searched for ectoparasites, looked as if it had been used before; it is a noteworthy fact that only one old nest from a previous year was ever found, in spite of the way such things are preserved for year after year in this cold and arid climate. Possibly the longspurs share the adaptation previously discussed in the case of the wheatear and redpolls.

Nest no. 1 was found to contain three eggs on June 10, so the first egg was probably laid on the 8th. It may be inferred that laying began in nests 6 and 7 as early as June 6. Eggs were of course laid daily, though in one case a day was missed and in another two were deposited between 10:45 one morning and 10 a. m. the next. Incubation begins with the first egg, for reasons already explained in the case of the redpolls (p. 382), and hatching was found to occupy from two to four days (six cases, distributed as follows: certainly two days, two; two or three days, two; three days, one; four days, one). The incubation period, from the last egg laid to the last one hatched, was 12 days in each of two exactly known cases.

Although two of the nests were not found until the young had hatched, enough is known about all to calculate the date of laying of the first egg within a day or two. Clutch-size appeared to decline with the season's advance; five clutches begun between June 6 and 15 numbered 5, 6, 6, 7, 7, and five begun between June 19 and July 2 numbered 4, 4, 5, 5, 5. (The probability is about 30 to 1 against the apparent difference being due merely to chance.)

We never once put the male off the nest, and assume (with Grinnell, 1944) that he normally takes no part in incubation; Blair (1936: 103), however, records both sexes being found incubating and covering the young in arctic Norway.

The most interesting observations we made of the longspurs relate to the normal desertion of the nest by the young on about the 9th day, with the wings still in pin feathers and three to five days or more before they can fly, in a manner characteristic of larks, and perhaps not uncommon in other Emberizinae, though seldom mentioned (*cf.* Nice, 1937: 130, and 1943: 18, 69). This had nothing to do with our interference in banding the young, for more than once they deceived us by leaving before we came to band them, and in one case by searching we found an unbanded chick not far away. In the case of nest no. 5, two had already gone on the date decided upon for banding, July 21 (at 3:30 p. m.); and one (99844) could not thereafter be induced to remain any longer in the nest, though 99845 and 99846 did so. On July 24, 99844 was caught, and later recaptured to make doubly sure, 350 meters from the nest and still unable to do more than flutter; an adult cock was with it. No. 99846 was still in the nest on the 22nd, and was caught on the 27th not far away, "not yet able to fly; it could flutter a few feet." This bird had probably been four days out of the nest and would require a couple of days longer before passing muster as a normally-fledged bird.

The spread of hatching led to broods of chicks of varying sizes, and the differences were not evened up during the nestling period. We have no records proving a spread of more than 48 hours in the time of abandoning the nest, though I suspect in some cases it involved a third day.

Grinnell (1944: 558) can scarcely have been unaware of the precocious dispersal of the nestlings, since he describes the state of feathering on "Day 10 (Date of leaving nest)"; but he makes no comment on it, and seems to have been mystified by the fact that the brood of nestlings he had been weighing daily "prematurely disappeared" before he visited their nest on the 8th day. Nicholson (1930: 295) also noted that "the young had rather prematurely left the nest." In our nest no. 2, four chicks just hatched and still wet at 1 p. m. on June 24 had gone before 7 p. m. on July 3, a maximum interval of nine days and some hours; the two remaining young of this brood hatched early on the 25th and left some time between 7 p. m. on July 3 and 8 a. m. on the fourth, a nestling period of 8.5 to 9 days.

As to the causes of this habit, it could perhaps in part be directly correlated with increasing the clutch size without increasing the size of the nest. Certainly towards the end the impression was given, both by the redpolls and the longspurs, that the nest was ready to burst and I was prepared at once to assume that dead chicks found in redpolls' nests had been suffocated. There is moreover the growing danger of attracting the arctic weasel as the young become daily noisier and as the odor of feces mounts. (The latter probably also attracts the blow-flies, whose larvae were found in all the examined nests of longspurs, Snow Buntings, redpolls, and wheatears.) It is not difficult therefore to see advantages in scattering the brood as early as possible, since it reduces the danger both from predators and from overcrowding in the nest. But the parents are probably presented with a more difficult task in providing enough food for each of the young after they are scattered, and the young are also deprived of the protection from cold and wet, and in general the uniform environment which they have previously enjoyed in the nest. It may be presumed that the advantages outweigh the dangers, and that once the young have acquired sufficient control of body-temperature their chances of survival are increased by dispersal.

Of 29 eggs whose history is known, all hatched; a brood of five chicks got wet

in a shower when one to two days old, were forsaken, and perished; one chick a few days old was found dead beside its nest, and one was accidentally crushed by one of us the day after it left. The chick last mentioned was preserved; its longest primary is 19 mm. from root (pulp cavity) to tip, of which 5 mm. is buried in the follicle, 10 mm. is ensheathed, and 4 mm. forms a brush at the tip. This emphasizes the callow state of the young at the time of leaving the nest.

Three males collected at the head of Clyde Inlet in June had wing-lengths of 91, 92, and 93 mm. (ave. 92), and three females of 86, 86 and 87 mm. (ave. 86.3). These accord with Hørring's (1937: 120) series taken further west and south, and with the measurements of the typical race.

Two females taken on July 23 and 26 were beginning to molt the flight feathers, but showed none of the body plumage yet renewed. Thereafter the birds became very secretive and a great many of them undoubtedly departed; we found them abundant on reaching Clyde Post on August 19, though only an occasional bird was then to be seen at Camp B. On August 10 there was a cock with no tail; and one or two were still left at Camp B on August 28. Meanwhile those at the coast had molted, and no males in summer plumage remained. Migration was well advanced, and the numbers considerably diminished, when we left on September 3. The following two days they were fairly numerous at Frobisher Bay Airfield.

The stomachs of three birds were examined. Those of a male and female on June 9 contained many identical seeds, perhaps from a *Carex*, the remains of beetles and a single large tipulid larva. The recognizable stomach-contents of a male on June 30 consisted entirely of insects, including one tipulid imago and one larva besides other fragmentary material. *Tipula* imagines were also commonly brought to the nestlings.

40. SNOW BUNTING, *Plectrophenax nivalis nivalis* (Linnaeus).—These were the most widely distributed breeding birds at the head of Clyde Inlet, being established almost wherever there were steep rocks from sea-level to 1000 meters. They were however much commoner at low elevations, and appeared to avoid the gigantic precipices of the fiords, which in places rise 1000–1500 meters out of the water.

Snow Buntings were seen more frequently than any other birds by our party on the Barnes Ice Cap, at a height of 850 meters above sea level, and 9 miles from "land." Six were reported on May 30 and "large flocks" on June 16; they had also been seen many times in the interval.

They were already established and singing by the time of our arrival at Frobisher Bay Airfield on May 19, at Clyde Post on May 22 and at Camp B on May 24. At this time their displays and song-flights at times resembled some loosely communal or sociable activity; they constantly quarreled and scolded one another, though their territorial claims were exceedingly small (Tinbergen, 1939: 20).

Although Snow Buntings are by far the earliest passerine migrants to arrive, their nesting is no earlier than that of the other species. A nest containing four young two or three days old was found on June 25 (first young Hoary Redpolls on 13th, longspurs on 22nd, etc.), and other young in inaccessible nests were being fed on the 29th and 30th. On the 24th we found a nest still being built, in which the first egg was not laid till the 26th; the fifth and last egg was almost certainly laid on June 30, and hatching occurred on July 11 and 12 (period from last egg laid to last chick hatched was 12 days). The chicks grew exceedingly fast and were almost ready to fly when banded on the 10th day.

Another nest found on July 28, containing six partly-incubated eggs, was deserted immediately (the only case out of 40 nests of all species under observation,

where our activities resulted in desertion). Three days later it was found that some animal, which could only have been a lemming or a weasel, had despoiled the nest and broken and eaten most of the eggs. These last two late nests were in crevices in the ground among boulders, both on steep north-facing slopes; the earlier one, in contrast, was open to the south on an unusually exposed ledge, which, although roofed over, allowed us a view of the whole nest and its contents. The nests were built chiefly of grasses, with other plants including *Cassiope*, moss, and roots (and in one case some pieces of mud), and lined with dry grass, ptarmigan and other feathers, and sometimes willow seed, or hare or lemming wool. After use one nest contained the pupae of 30 blow-flies, and a maggot was lodged in the feathers of one of the chicks we banded. Undoubtedly the commonest nest sites were in cliff-cracks, to which we could not obtain access.

In fine weather in July the Snow Buntings reveal themselves as adept fly-catchers, rising every few seconds to snap at a passing insect, and returning to their perch, with little if any more effort than a phoebe or a flycatcher. They frequently catch the large *Tipula arctica*, and I watched one on July 18 catch, fight with, and carry off an *Oeneis pearliae*, one of the large arctic "black" butterflies.

After July 20 there was a sharp reduction in the number of Snow Buntings to be seen at Camp B. A female collected there on July 29 had just begun to molt; by the end of August at Clyde Post only fully molted adults or young birds were seen.

SUMMARY

The writer, assisted by Alexander Anderson, resided at 'Camp B' at the head of Clyde Inlet (69° 50' N, 70° 25' W) from May 24 to August 12, 1950. The locality was biologically rich compared with either the adjacent coastal belt or with the interior. In mid-August a visit was made by plane and boat to the immense fulmar colony at Cape Searle. Observations made during the Macmillan Expedition to Frobisher Bay in August 1937 are also incorporated. The material relates to 40 species, and is arranged in systematic order.

Special attention may be directed to the following items.

1. The number of Small-billed Fulmars found at Cape Searle was about 200,000. White-headed birds constitute about 13 per cent, the remainder being intermediate and dark. The nesting colony is one of four or five thought to exist in arctic Canada (Pp. 358-361).

2. A great number of drake King Eiders passed eastward across the waist of Baffin Island in July and August, following a narrow route leading to Baffin Bay through Clyde Inlet. Observations by Salomonsen and others make it appear probable that the migration witnessed by us continues directly to West Greenland where the birds join others from further north and undergo their eclipse molt. King Eiders from arctic lands lying west of Baffin Island appear to share in this "molt migration." Later in the fall they move to their winter quarters in southwest Greenland. A different route is followed on return in spring (Pp. 362-364).

3. White Gyrfalcons and Duck Hawks were both breeding at Camp

B. The fledging-period of the former was 46-49 days, and three young were reared (Pp. 364-366).

4. Rock Ptarmigan (and both species of lemmings) were at a very low ebb of numbers in our vicinity in 1950 (Pp. 366-367).

5. Both Ringed and Semipalmated plovers were found to be present in similar numbers, but keeping strictly segregated. Both appeared to be breeding though this was proved only of the Semipalmated. Barriers to the formation of mixed pairs evidently exist, so that in spite of their extreme resemblance the two birds act like distinct species (Pp. 367-369).

6. In the case of the Black Guillemots, it is pointed out that what is known as *arcticus* in fact resembles a hybrid swarm in its variable recombination of the characters of *atlantis* and *mandtii* (P. 374).

7. The Horned Larks clearly present a hybrid swarm, the extreme or parental types being the very distinct forms *alpestris* and *hoyti*, as previously found in southern Baffin Island by Soper. Interbreeding occurs at random, and the population shows gradation between the extremes (Pp. 375-376).

8. The redpolls, *A. h. hornemanni* and *A. flammea rostrata*, behave as distinct species in that they do not interbreed or hybridize. No differences whatever could be found in their ecology, however. Consideration is given to the operation of natural selection in cases such as this, and to population dynamics in the Arctic (Pp. 380-385).

9. Particular attention was paid to the breeding-biology of the small passerines, and it was found, for example: that wheatears, redpolls, and perhaps Lapland Longspurs generally re-use old nests, merely relining them each year and evidently saving valuable time thereby; that in small birds some incubation is necessary from the time the first egg is laid to keep it from freezing, and hatching in consequence is usually spread over two to four days; that Lapland Longspurs, like various larks, leave the nest some days before they can be said to fly; and that there is an excess of males and a notable absence of territorial disputes in all six species of small passerines.

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LIFE HISTORY OF THE BLUE AND WHITE SWALLOW

BY ALEXANDER F. SKUTCH

THE attractive little Blue and White Swallow, *Pygochelidon cyano-leuca*, is well described by its name. Its upper plumage is dark, violaceous steel-blue; the under parts are pure white except for the blue-black under tail-coverts, the grayish-brown sides and flanks, and a few dusky spots in the center of the chest, which are lacking on some individuals. The tail is short and slightly forked. The bill is black, the eyes brown, and the feet dark. The sexes are alike in appearance.

The species is distributed over almost the whole of South America, but in Central America its range extends only as far north as Costa Rica. It exhibits so little geographical variation that individuals from Costa Rica and from northern Argentina are placed in the same subspecies. Yet the Blue and White Swallows adapt themselves in amazing fashion to extremes of temperature and rainfall. In western South America I found them on the rainless guano islands off the coast of Perú, where in the evening they flew about catching insects above the guanayes which in their thousands had settled in compact masses to pass the night on the bare ground. They were the common swallows of the Ecuadorian Andes, present in the high, cold *hoyas* nearly 10,000 feet above sea-level, and over the excessively rainy eastern foothills. Voyaging over the upper Amazon and its great tributaries, I occasionally watched them skimming over the turbid water in company with White-winged Swallows (*Iridoprocne albi-venter*), White-banded Swallows (*Atticora fasciata*), and wintering Barn Swallows (*Hirundo rustica*); but they were far less numerous here than in the mountains.

In Costa Rica, at the northwestern extreme of its vast range, Carriker (Ann. Carnegie Mus., 6 (4): 789, 1910) considered this to be the "most abundant resident swallow;" but my own experience has been that it is less abundant and widespread than the Rough-winged Swallow, *Stelgidopteryx ruficollis*, which in the lowlands at least is the more common species. In this country, the Blue and White Swallow is found chiefly in the sections where the human population is fairly dense and where there are plenty of buildings in which the birds can nest and open fields above which they can forage. It is abundant in the central plateau and the surrounding mountains. At Vara Blanca, on the northern slopes of the Cordillera Central, I found it nesting freely in clearings in the heavy forest of this extremely wet and stormy

region, between 5000 and 6000 feet above sea-level. In the southwestern section of the country it is well established in the Térraba Valley, especially about the villages, such as San Isidro (2200 feet) and Buenos Aires (1400 feet); in the wilder parts of the valley it is less often seen. It appears to be absent from the coastal lowlands and from the Province of Guanacaste.

In its manner of life the Blue and White Swallow differs little from other members of the family. It subsists largely, if not wholly, upon insects which it catches in the air as it weaves back and forth over the open fields, the house-tops, and bodies of water. When tired it rests in company with swallows of its own and other species upon exposed perches—leafless branches of trees in the wilder country, telegraph and electric wires by preference when these are available. Its song is a thin, weak, long-continued trill which slides upward at the end. In Costa Rica it is delivered more or less frequently at all seasons, but chiefly from March until June, when the swallow nests. Apparently over its immense range the Blue and White Swallow varies as little in voice as in plumage. Hudson (*Birds of La Plata*, 1920: 40), who knew it in the La Plata country, describes its song as "a single weak trilling note, much prolonged, which the bird repeats with great frequency when on the wing. Its voice has ever a mournful, monotonous sound, and even when it is greatly excited and alarmed, as at the approach of a fox or hawk, its notes are neither loud nor shrill." This description would apply equally well to the utterances of the Blue and White Swallows of Costa Rica. When alarmed they voice full, plaintive monosyllables and when angry, as when disturbed at their nest, low harsh notes.

NEST-BUILDING

The Blue and White Swallow builds its nest in a closed space of some sort. As to the nature and position of the cavity it is, if possible, even more tolerant than the Neotropic House Wren, *Troglodytes musculus*, with which it associates over much of its vast range, the two species often nesting in the same building. At Vara Blanca, within a distance of half a mile, I found these swallows nesting in positions so diverse as—a cavity formed by decay in a dead trunk standing in a pasture; tunnels in roadside banks, made by other birds or left by the disintegration of a stout root; and upon the ridgeplate of a cottage, beneath the sheet-iron roof. The two nests in burrows were, respectively, 10 and 23 inches back from the mouth. In other parts of the country nests are built beneath the unglazed roof-tiles of farmhouses. Thatched roofs also provide acceptable nest-sites (Carriker, *loc. cit.*).

One pair fed nestlings in a cranny above the lintel of the doorway of a lawyer's office, opening directly upon the narrow sidewalk of a busy street in the heart of the city of San José, Costa Rica. Several pairs appeared to be feeding nestlings in crannies in the masonry abutments of the highway bridge over the Río Verde, in the Pastaza Valley of eastern Ecuador. Hudson (*op. cit.*), who called this species the "Bank-Martin," found it nesting in holes in the banks of streams, in the sides of artificial ditches, and even in the walls of wells. But on the open pampas of Argentina its favorite nest-site was a hole which the Miner or Little Housekeeper, *Geositta cunicularia*, had bored into the wall of one of the great burrows dug by the viscacha, *Lagotomus*, and which the swallow claimed after it had been abandoned by the bird that made it. Hudson states that "Bank-Martins," or Blue and White Swallows, never dig into the earth themselves, which agrees with my experience in Costa Rica. In wild mountainous regions, our swallow nests in inaccessible crannies in cliffs (Todd and Carriker, Ann. Carnegie Mus., 14: 436, 1922).

At Vara Blanca, 5500 feet above sea-level, the Blue and White Swallows began to build in March; a completed nest was found on March 28, 1938, and another was started about March 31. In the basin of El General, 2500 feet above sea-level, a pair began on February 15, 1944, to carry straws beneath the roof-tiles where they had long been sleeping, but during the next fortnight they worked in an exceedingly desultory fashion, and did not build with zeal until about the first of March.

Four nests of which I watched the construction were built by male and female working together. The swallows prefer to gather their straws and grass-blades from bare ground, such as a roadway, path, or cultivated area, where they are scarce, rather than from neighboring grassy fields where such material is more abundant. This is probably because the birds find it easier to alight on and take off from the bare earth than from the uneven and yielding grass. Some of the pieces which they select are very long and trail far behind them as they fly. Once they have taken a piece of material in the bill, they set a fairly direct course to the nest, not circling around with their burden as I have seen Cobán Swallows, *Notiochelidon pileata*, do. But in the intervals between their journeys to the nest, they gyrate tirelessly around in their usual fashion. One pair built chiefly during the early morning, and for a short period in the late afternoon just before they retired early to sleep in their nest-space. During the middle of the day they were often out of sight of the nest, but sometimes brought material more or less assiduously.

One pair of Blue and White Swallows built its nest in about a week; but the pair which was first seen carrying material on February 15 did not finish its work until about March 13, and one member was even seen bringing a feather on March 16. It was only toward the end of this long interval, however, that they worked with a degree of diligence. The completed nest is a loosely made, shallow bowl composed of straws, grassblades, and similar material and warmly lined with downy feathers, often those of domestic fowl.

THE EGGS

Male and female swallows continue to sleep on or beside the nest during the period of construction and during the interval between the completion of their work and the beginning of egg-laying. Indeed, they will as a rule continue this custom until their nestlings are feathered, if not longer. The earliest eggs of which I have records were laid in El General on March 19, 1944, and at Vara Blanca on April 2, 1938. Usually, an egg is deposited daily until the set is completed, but at one nest two days elapsed between the appearance of the first and second eggs. From Costa Rica I have records of two sets of two eggs, four sets of three eggs, and one set of four eggs. Both sets of only two eggs were laid by the same pair of swallows, and those in the first and apparently also the second of these small sets were infertile. Beyond the tropics in Argentina, where the Blue and White Swallow is migratory, it lays sets of five or six eggs (Hudson, *op. cit.*). The glossy, pointed eggs are pure white, without markings. The measurements of six eggs from Costa Rica averaged 16.6 by 12.2 millimeters. Those showing the four extremes measured 16.7 by 12.7, 16.3 by 11.9 and 16.7 by 11.5 millimeters.

INCUBATION

The eggs are incubated by both sexes. At various times during the period of incubation, I watched for a total of nine hours a nest situated on the ridgeplate of a cottage. Twenty-five periods of incubation, sometimes by the male and sometimes by the female, ranged from 3 to 50 minutes in length and averaged 18.6 minutes. The eggs were neglected for 11 periods ranging from 1 to 14 minutes and averaging 6.9 minutes. They were covered for 85.9 per cent of the 9 hours. During the early morning and in rainy weather they were constantly incubated by both members of the pair sitting alternately; but later in the day, when the sun heated the iron roof close above the nest, they were left for brief periods while both swallows flew around together catching insects. When ready to return to the

eggs, a swallow would often fly up in front of the entrance to the niche as though about to go in, only to veer aside at the last moment and continue to circle in the air a few times more, catching additional insects before it resumed brooding. Usually the new arrival would enter the niche, then almost immediately a swallow would dart out. More rarely the two stayed in the nest together for a few minutes before one flew away. I could not watch the birds change places on the nest in its dark cranny, but once I clearly saw the swallow which had been sitting brush past the other on its way out, leaving the new arrival to take charge of the eggs. In the evening both members of the pair retired early to the niche, where one slept upon the eggs, the other on the rim of the nest in close contact with its mate.

One morning while I watched these swallows, the green lizard which dwelt in the wall of the cottage climbed up to the end of the ridgeplate and started in toward the nest. But after a few seconds it scuttled out and hurried down the wall, evidently driven away by the swallow in charge of the nest. Then the swallow moved forward to a point near the end of the beam where I could watch it. It stretched up its neck and opened wide its mouth, probably at the same time emitting some hissing or rasping sound too slight for me to hear. It repeated these motions a number of times and then withdrew into the dark cranny.

At another nest which I studied five years later, the swallows incubated more constantly. During 4 hours of watching I timed 4 completed sessions by both sexes, which lasted, respectively, 34, 59, 48, and 81 minutes. The nest was left unattended only twice, for periods of 1 and 14 minutes. Possibly this pair took longer sessions because these birds usually foraged out of sight, and the sitting partner was not distracted by its mate's calling as it foraged near the nest. Since this nest was beneath a roof of tiles rather than one of corrugated iron plates, it did not become so strongly heated by the mid-day sun and the swallows could incubate in greater comfort.

At two nests the period of incubation was 15 days. At one nest, infertile eggs were incubated for at least 26 days before they were found on the ground below the nest.

THE NESTLINGS

Newly-hatched Blue and White Swallows are pink-skinned, with sparse, light gray down and tightly closed eyes. The interior of the mouth is a pale flesh-color. When the nestlings are four days old the rudiments of the feathers are visible as dark points beneath the skin; when nine or ten days old they begin to acquire a covering of feathers.

They are fed by both parents, and remain in the nest until they are well feathered and can fly well. Those of one brood took wing when 26 and 27 days of age. In their juvenal plumage the Blue and White Swallows are dark gray instead of deep blue above, and their under parts are clouded with gray instead of being pure white like those of the adults. Their remiges and rectrices are black.

THE SECOND BROOD

At Vara Blanca, a pair of Blue and White Swallows whose last nestling of the first brood took wing on May 30 began to renovate the old nest on June 10. They covered it with fresh straws and grass-blades, gave it a new lining of feathers, and laid a second set of three eggs on June 17, 18 and 19.

At Baños, Ecuador, less than two degrees south of the equator, Blue and White Swallows were feeding nestlings in October. Whether these were early or late broods I do not know.

SLEEPING HABITS

In Costa Rica, the Blue and White Swallow is non-migratory and remains paired at all seasons, possibly mating for life. After the members of a pair have selected a suitable cranny, it becomes their permanent home where they sleep, take shelter from the rain, and bring up their families. By day they may forage in company with other swallows beyond sight; but the approach of night, or a hard shower, brings them back to their domicile. Trespassers of their own kind are not tolerated in the home precincts; their presence gives rise to excited pursuits, sometimes ending in a struggle in which the contestants clinch and fall to the ground, to rise in a few moments apparently none the worse for their encounter.

Family I.—During the year I dwelt at Vara Blanca in the Costa Rican highlands, I had as neighbors a pair of Blue and White Swallows that slept and nested under the roof. The original pair, appearing toward the end of January, was to be found day after day circling on tireless wings about the cottage standing in the midst of pastures on the back of a narrow ridge. Often the birds fluttered up beneath the eaves, apparently seeking a nest-site so early in the year. Sometimes a third swallow arrived or rarely a fourth and then there was animated aerial pursuit, accompanied by sharp, loud calls. At times pursuer and pursued struck momentarily in the air. After a while, the visitors would withdraw, leaving the two who claimed the house to gyrate in peace around their chosen shelter.

By early March, the pair had still not begun to build; nor had I discovered where they slept. On the evening of March 6, they continued to fly around the house on the hilltop until after sunset, and I thought that at last they would roost under the roof. While I stood waiting to see them enter beneath the eaves, a little White-throated Falcon, *Falco albicularis*, swooped down, seized one of the swallows in its talons, and carried it off to devour it high up in a dead tree in the pasture. The survivor of the pair flew off over the deep wooded gorge of the Rio Sarapiquí and vanished through the dusk. Next morning, a swallow made a brief visit to the scene of the tragedy. Three days passed before I again had a pair of Blue and White Swallows flying about the house. I think that the survivor of the earlier pair had returned with a new mate.

Late in the afternoon of March 12, one of the pair, which had been winging together about the house, entered the narrow space above the ridgeplate and beneath the corrugated iron sheets at the northern end of the roof. Here it chirped loudly, while its mate continued to circle about outside. After an interval, the second swallow fluttered up to the cranny in a tentative fashion several times over, then at last entered. The two rested side by side upon the two-inch-wide top of the beam, twittering softly. The white breast of one shone out from the dusky nook. While they lingered here, a third swallow, that had been flying about the vicinity, darted up to the entrance as though to join them. But it immediately dropped away again and continued its untiring flight. Several times, as the day waned, the pair sallied forth for an excursion over the mountain-side, then returned to the nook; several times the third swallow fluttered up under the peak of the eaves as though to join the two who rested there, yet did not. As the light grew dim, rain began to fall, and the third swallow vanished, leaving the two together on the ridgeplate. I felt sure that they would at last sleep beneath my roof, but suddenly, in the deepening dusk, one darted forth and vanished through the gloom, leaving its mate alone in the niche.

The following morning was darkly overcast, and the lone swallow lingered on the ridgebeam, its white throat gleaming in the narrow cranny, while other birds flew and sang and foraged. Half an hour after daybreak, two swallows flew up from the east and joined the one in the niche. All three promptly flew out and circled around; then two returned to the nook, but stayed less than a minute.

This play continued for about a week. One of the pair slept on the ridgeplate, its mate apparently used a distant shelter and the situation was complicated by the intrusion of a third individual. In the late

afternoon, the pair would enter the nook and rest close together, the male sometimes singing his fine, sharp trill with a rising inflection at the end. After a while, one would fly out and the mate would call with loud, full-toned, chirps; then either the second would follow the first into the open, or the latter would rejoin the other in the niche—a reunion followed by contented chirpings. Finally, dusk falling, one would fly away out of sight, leaving its mate alone on the ridgeplate. Here it remained until the next morning, when its mate flew back across the ravine and entered beside it. Sometimes the third swallow would follow. Soon the two would fly out together to feed. Before the end of the month, the one that slept beneath the roof abandoned this dormitory. Yet both continued to rest on the ridgeplate in the late afternoon, sometimes at the northern end, sometimes at the southern.

Thus it happened that this pair had not settled upon the niche above the ridgebeam as a dormitory when they began to build there on the last day of March, at the more sheltered southern end. Male and female shared the task of nest-construction, picking up bits of straw from the bare ground of the flower-beds. Much of this material fell from the sides of the two-inch beam; and the swallows probably would not have completed their nest had I not given them a broader support by closing off with cardboard the spaces between the ridgeplate and the underside of the roof. Soon they had straws scattered along the length of the long beam. In the afternoon, the pair rested side by side on the beam, often creeping along until they were above the center of the house, far inward from their nest. They appeared to be indifferent when I climbed up into the dark attic to look at them from below with an electric torch. Often the male would sing, his minutely trilled song penetrating the thin ceiling above me as I wrote up my notes on rainy afternoons. Before the nest was completed, the pair began to sleep on the middle of the ridgeplate, behind it.

After a week's work, the shallow cup of straws and dry herbaceous stems was finished. Now the swallows slept upon the nest, or close beside it. Another week passed before the female laid the first of her four white eggs. Evidently it was she who covered them by night, while her mate slumbered upon the rim of the nest, his white breast resting upon her dark blue shoulder. Both sexes incubated, sitting very constantly in cool and cloudy weather, but when the sun shone and the iron plates above them became hot they stayed on the eggs for brief periods only. I tried to make them more comfortable by draping a thick coffee sack over the ridge of the roof. After 15 days of incubation, the eggs hatched. When two weeks old, one of the little birds

fell from the nest and, before I found it, died on the floor below; the other three were successfully reared. While the nestlings were young, their parents slept in the same manner as during incubation, one brooding in the nest and the other resting upon the rim. When the young swallows were two weeks old and well clothed with feathers, their sharp cries resounded through the whole cottage each time they were given food, and they were no longer brooded. One of the parents now roosted on the ridgeplate behind the nest, the other in some undiscovered situation.

When 20 days old the nestling swallows began to wander along the beam and at night rested on the bare wood behind the nest rather than in it. Now the second parent deserted them in the evening, flying away with loud cries through the dusk. During the day, both parents brought abundant food to the nest, but they began feeding very late, an hour after most birds had begun their day's activities.

The young swallows flew into the open when 26 and 27 days of age. During their last week in the nest they slept alone. After their departure from the nest, the parents led them to rest on the ridgeplate, but at the northern end rather than by the nest at the opposite extremity. At this season—the end of May—the afternoons were usually rainy, and the youngsters retired at an early hour. On the day the last fledgling departed, they took shelter in the nook at 3:30 p. m. The next day a hard shower fell early, and they entered at 1:20 in the afternoon and remained until nightfall. While they rested here, warm and dry, their parents flew about in the rain to catch insects for them. Each return of a parent with food was greeted by a chorus of loud chirrup. At times the adults would rest for 15 or 20 minutes beside their young, the male sometimes singing his high-pitched trill and also a low, bubbling note. Then the two would dart forth into the rain together, to collect more insects for the youngsters. As evening approached, they rejoined the fledglings for the night. The five slept pressed close together in single file on the ridgeplate, the three young swallows farthest in. Their slumber was not sound and, being somewhat wakeful myself, I repeatedly heard their weak chirps above me during the night. In the morning, the whole family lingered late, not leaving the roof until a few minutes before sunrise. The young swallows were not given food before they left their sleeping nook, but they sallied forth after their parents had been circling about the house for five minutes or less and flew swiftly out of sight with them.

After they had been three days in the open, the young swallows formed the habit of going to rest between four and half past four in the

afternoon, depending upon whether it was raining hard or only drizzling. Ten days after their departure from the nest, they no longer received food from their parents after their early return to their sleeping-nook. A day later, the adults began to renovate the nest, carrying up bits of grass from the yard to cover over the old structure with a layer of fresh material. Then the parents slept upon the reconditioned nest, leaving their young to slumber alone at the opposite end of the long ridgeplate. The 39-day-old swallows already appeared to be quite independent of parental care, for in the morning, while the parents lingered upon the nest, they flew out and winged rapidly away. When at length the adults emerged, they did not go off in search of their offspring but circled around the house hawking for insects. Two hours later, the three young swallows returned and joined in these aerial gyrations, catching their own food, and receiving none from their parents.

Eighteen days after the departure of the first brood, the female swallow began to lay a new set of three eggs in the refurbished nest. Soon after this, two of the young birds ceased to sleep under the roof, but the third continued to pass the night alone at the northern end of the beam until early July, when it, too, vanished, aged a little over two months. The parents were not so fortunate with their second brood as with the first; two of the nestlings succumbed at an early age during a long-continued rainstorm and the third, when half grown, died as a result of the invasion of the cottage by a horde of army ants that ransacked it from foundation to roof-tree. Yet despite their loss, the pair of Blue and White Swallows, now thoroughly attached to the house, continued to sleep side by side upon the ridgeplate, until August when my sojourn in this rainy region came to an end.

On an evening a short while before my departure, when it was already nearly dark, I heard a commotion above my head, and went up into the attic with a light to investigate. During the day a number of bats, hanging head downward, slumbered in this dark space beneath the roof. One of these bats tried to reach the outer air by working along the ridgeplate, but it found its passage blocked by the two swallows who had long since retired and were reluctant to fly forth into the gathering darkness. They firmly held their ground, uttering the harsh note they emitted only when angry or frightened, while the bat protested with a sharp, rapid chittering. The birds and the bat were almost in contact when I arrived, but upon the approach of the light the swallows withdrew to the outer end of the beam, beyond the wall, while the bat moved inward toward the center of the house. Later it must have found another mode of egress, for when I went up

at the end of the night, I found the swallows sleeping in their usual position and the bat gone.

Other Blue and White Swallows in the vicinity behaved in much the same fashion as the pair that nested on the ridgeplate. A pair which built in a burrow, which they found ready-made in a bank, slept together on the nest, one in the cup and the other on the rim, before they had eggs, during the period of incubation, and while the nestling was growing up. They continued to use the burrow as a dormitory after the disappearance of their newly-emerged fledgling. Another pair, which reared three fledglings in a natural cavity in a decaying trunk in a pasture, led the newly-departed youngsters back to sleep in the hollow with them. Two of these disappeared early, but the third continued to spend the night in the same hole with the parents, even after it had become otherwise independent of them. One of the family would depart alone in the morning, and two, doubtless the mated pair, together. Sometimes the pair, sometimes the young bird, would emerge first and fly away without waiting for the others. The first might leave from eight to ten minutes before the last.

Family II.—For a little over two years, a pair of Blue and White Swallows made its home under the roof-tiles at the rear of my house in the valley of El General, and in three consecutive breeding-seasons they tried in vain to rear a brood there. Appearing first about the end of March, 1942, they slept together in various of the innumerable nooks which the roof of rustic, unglazed tiles provided for them. About the first of May they began to build in a cavity which was difficult for me to reach, and I did not attempt to examine their nest. Although their effort to raise a brood was unsuccessful, the two swallows continued to sleep together under the tiles through the remainder of the year and the early months of the following year. After their morning exit they would fly rapidly out of sight and remain away all day. By the middle of February, 1943, they began to spend more time in the vicinity of the house, and on February 27 one was seen to pick a straw from the roadway and carry it up beneath the tiles where they slept. This revealed a growing interest in a nest-site, although building was not yet undertaken in earnest.

Early in April, before the nest was finished, one of the pair vanished. The other lingered a few days longer, but on the morning of April 8 it was not seen to emerge from its usual sleeping-place beneath a tile. That same evening two swallows arrived together. One of them without hesitation darted up under the lowest tile of the end row, the usual point of entry. The other flew around and around, clinging to the walls of the house or beneath the eaves here and there, unable to

find its way in. Meanwhile the first, unseen beneath the tiles, sang again and again. At last it darted out and joined the other. After winging around the house, both returned to the sleeping-place together, the first entering easily, the second after a moment's confusion. On previous evenings, the swallows had gone to rest in a more direct manner. I think it a fair inference that the male of the pair which had already slept in my roof for over a year had lost his mate, stayed alone for a few nights, was absent for a night or so while he sought a new partner, then returned with another mate. Since she was not familiar with the roof with its hundreds of entrances leading into as many narrow passageways which did not communicate one with another, he sang at first to guide her to him, then, voice proving a poor guide in so bewildering a situation, came out to show her where to enter.

The next morning, April 9, the pair flew about the eaves examining the many crannies available to them as nest-sites. By April 15 they were actively building under a tile of the outside row at the rear of the house, and here they slept. In due course the nest was completed, and in early May two eggs were laid. These were incubated for nearly a month and turned out to be infertile. Then early in June they were found on the ground, one broken but the shell of the other merely perforated by a little hole which apparently had been made by the bill of the small bird which removed it. At the end of a week the swallows had relined the nest with dark-colored, downy feathers, and the female had laid two more eggs. Before another week had passed, these also were found lying broken on the ground beneath the eaves. Apparently they contained no yolk. I was not sure what had removed the eggs, but I strongly suspected the Neotropic House Wrens which at the ridge of the roof were bringing forth their broods in regular sequence, without mishaps.

When the second set of eggs was lost, it was only June 12, and many birds of other species were still nesting, but the swallows apparently made no further attempt to rear a brood that year. In spite of their failures to rear a brood, the two swallows continued for more than four months to sleep on or near their nest.

In early November, first one and then the other swallow disappeared. For two weeks I failed to see a swallow fly up beneath the tiles in the evening or dart out in the morning. Then, late on the rainy afternoon of November 26, while removing some stored lumber from above the rafters at the back of the house, I became aware of a pair of swallows flying around in the gloom outside. After I descended to the floor they soon entered a nook beneath the tiles—the same one in

which the swallows had slept for so long. The fact that the pair went to roost in this particular spot, instead of in some other of the many spaces available beneath the tiles, was for me conclusive evidence that at least one of the two had already slept there. The following afternoon this one entered its dormitory without difficulty, but the other appeared confused and continued to fly up to neighboring parts of the eaves, unable to find its mate until the latter came out and led it back to the proper row of tiles. Since the first to enter sang while awaiting the other, I believe that again it was the male which had lost his mate, and I was witnessing a repetition of the act I had seen the preceding April, when the male had brought back a new mate who needed to be led into his customary sleeping-place.

On subsequent evenings, the female swallow repeatedly entered the channels beneath tiles one, two, three, or even four tiers removed from that where her mate had gone to rest. Then sometimes she would complain in clear notes that sounded mournful to me, while the male answered with his fine trill from beneath the marginal row of tiles. Since there was no passageway connecting the channels beneath the different longitudinal rows of tiles, she had no recourse except to fly out from the lower end and try again and again to strike the proper space. The male would continue to sing and she to call until the two were united in their sleeping quarters; then both became silent. A week passed before the female was able to enter without mistakes.

During the long period between nesting seasons, I gave much attention to the swallows' times of leaving the roof in the morning and returning in the evening. Long after practically all their bird neighbors had become active and only 10 or 15 minutes before the sun flamed up above the crest of the forest on the eastern ridges, they would dart out from beneath the tiles. Usually they would emerge almost together, but on some mornings, especially as the subsequent nesting-season approached, one would linger for a minute or two, rarely for as much as five minutes, after its mate had darted out and winged away beyond sight. On clear, cool mornings they would sometimes show themselves beneath the edge of a certain misshapen tile that did not lie flat and stand here looking out for several minutes before they flew forth. Usually as soon as they came into the open they would turn their courses up the valley of the Río Peña Blanca, that flowed in front of the house, and fly toward the high craggy summits of the Cerro Chirripó until lost to view. Then they would stay away all day. How far they went I could never discover.

The hour of the swallows' return to their sleeping-place depended largely upon the weather, but at the latest it was earlier than that of

nearly all other birds in the vicinity, including both their relatives, the Rough-winged Swallows that roosted in a nearby cane field, and their neighbors the House Wrens who also slept beneath the tiles. On clear evenings they might on rare occasions remain out until half past five, but usually, especially about the time of the winter solstice, it was five o'clock or even earlier when they went to rest. On the rainy afternoons so frequent during the second half of the year they would seek shelter far earlier. On some dark, wet afternoons they went into their nook soon after three o'clock, but if the rain abated before sunset they might come out again and circle around catching insects for a while before their final return for the night. If the rain continued to come down hard until nightfall, they would stay beneath the tiles. In this region, rain in the forenoon is infrequent and almost never hard, and I did not see the swallows take shelter from a morning shower. But a slow rain at daybreak sometimes delayed their departure for from 10 to 15 minutes beyond their usual time for emerging.

In the middle of February, 1944, the pair began to take straws into the niche beneath the tiles. Now they began to linger near the house during the day instead of remaining out of sight, and they sat together in their nook or in other spaces beneath the tiles for many minutes while the sun was high. The male often sang while the pair rested side by side under a tile. By the end of February they were building actively, by March 13 had practically completed their nest, and on March 19 the female laid the first of three eggs. This year the swallows got farther than in the two preceding years. They hatched three nestlings and attended them until they were a week old. Then the three young swallows mysteriously vanished. After three seasons of failure to rear offspring, the Blue and White Swallows deserted my roof. During seven subsequent years a pair of these swallows has from time to time arrived to investigate the crannies under the tiles, but they have never successfully nested here, nor again slept here for many consecutive nights.

SUMMARY

1. The Blue and White Swallow is an exceptionally adaptable species. Its range stretches from Costa Rica to Argentina, and within this vast area it is at home in habitats as varied as the open pampas, the Amazon and its tributaries, the high Andes, the desert guano islands of Perú, and the rain-drenched Costa Rican mountains.

2. In its habits of catching insects on the wing and resting on exposed twigs or wires, it scarcely differs from other swallows. The song, a thin, weak, long-continued trill, is in Costa Rica delivered more or less frequently throughout the year.

3. Almost any covered nook or cranny is acceptable as a nest-site. Nests have been found in cavities in trees, holes in banks, niches in masonry bridges, crevices in house walls, and beneath roofs of thatch, tiles, or sheet-iron. Both sexes join in building the shallow structure of straws and the like, lined with downy feathers.

4. In Costa Rica, two to four white eggs form the set, with three the most frequent number. Laying begins in March and second sets are laid in June. The eggs are usually deposited on consecutive days.

5. Both sexes share incubation, sitting from three to 81 minutes at a stretch. At two nests the incubation period was 15 days. One pair attended infertile eggs for at least 26 days.

6. The nestlings are fed by both parents and remain in the nest-space until they can fly well. Those of one brood took wing when 26 and 27 days old. At about 40 days of age they became independent of parental care, but continued to roost in the nest-space with their parents.

7. The roosting habits of one family were followed for over six months, of a second for over two years, and less extended observations were made on other pairs. The pair of swallows remain together throughout the year and use the nest-cranny as a fixed abode, the two sleeping here each night, and sometimes entering by day to take shelter from heavy rains. During the course of incubation one, probably the female, sleeps on the eggs, while the other roosts on the rim of the nest, in contact with its mate. The fledglings return to sleep in the nest-space with their parents, and may continue this habit until two months old, although the old birds no longer attend them and may proceed to rear a second brood.

8. Within this general pattern individual variations were observed. With one pair, only one bird slept in the nest-space before building began, and this one not consistently. During incubation, and while the nestlings required brooding, the parents slept together at the nest. But after the nestlings were older, one and then the other parent chose a distant roost. During their second nesting this pair followed the normal pattern and always slept together on or by the nest.

Finca 'Los Cusingos,' San Isidro del General, Costa Rica, July 17, 1951.

BLACK-CAPPED AND CAROLINA CHICKADEES IN THE SOUTHERN APPALACHIAN MOUNTAINS

BY JAMES T. TANNER

INTRODUCTION

THE Black-capped Chickadee, *Parus atricapillus*, and Carolina Chickadee, *Parus carolinensis*, are two closely related and very similar but distinct species of birds. The ranges of the two are different but contiguous and, in the non-breeding season, occasionally overlapping. Both species are found in the southern Appalachians, where their nesting ranges differ in altitude and where they may nest within a mile of each other. This situation provided an excellent opportunity to study the relations between these two species and to attempt to answer the following questions: Do the two species intermingle and perhaps interbreed? If they remain separate, what factors operate to keep them separate? Is there competition between the two species?

Most of the field work for this study was carried on in the Great Smoky Mountains National Park, and there I was greatly helped by the full cooperation of the Park Naturalist, Arthur Stupka. Specimens for this study were obligingly loaned from the collections of the United States National Museum, the Museum of Comparative Zoology, Albert F. Ganier, and George M. Sutton.

CHARACTERISTICS OF THE TWO SPECIES

Measurements.—The most obvious, though not the most consistent, difference between the two species is in size, the Black-capped Chickadee being the larger of the two. Table 1 shows the distribution of tail and wing lengths in the two species, regardless of sex, and illustrates the considerable overlap in each of these two measurements when taken alone, and the small overlap when the two are considered together. In both species males average larger than females, but their measurements overlap as can be seen from Table 3. Tail length was measured from the insertion in the skin of the two central tail feathers to the tip of the longest tail feather. Wing length was measured from the bend of the wing to the tip of the longest primary, with the feathers flattened. Only specimens collected in the months of September through March are included here, to eliminate the possible error caused by heavy wear during the nesting season. The Black-capped Chickadees whose measurements are recorded here were from the southern Appalachians, and the Carolina Chickadees were from the states containing these mountains, *i. e.* West Virginia, Kentucky,



CAROLINA CHICKADEE. PHOTOGRAPHED JANUARY 15, 1950, ON THE CARL KRIPPENDORFF FARM NEAR GLEN ESTE, CLERMONT COUNTY, OHIO, BY KARL MASLOWSKI AND WOODROW GOODPASTER.



Black-capped Chickadees usually average heavier in weight than do Carolina Chickadees.

Plumage.—Plumage differences are small, but are sometimes useful in identifying specimens. The most characteristic difference is that Black-capped Chickadees have wider and whiter edging to the secondaries than do Carolina Chickadees. The edging on the wing feathers of Carolinas is grayish or even brownish. Many, but not all, Black-capped Chickadees have a distinct white edge to the outer vane of the outer tail feathers, while in Carolinas this is at most only a gray edge. In many Black-capped Chickadees of the southern Appalachians the brown of the sides and flanks contrasts well with the gray mid-breast and belly, a pattern that is very rare in Carolinas where the underparts tend to be uniform gray or brownish gray. All these plumage differences are most pronounced in fall specimens and tend to disappear in worn, breeding individuals.

Voice.—To most observers the difference in song has appeared to be the best way to distinguish between the two species in the field. The song of the Black-capped Chickadee is usually a clear, whistled 'phe-bee-ee,' or less often, 'phe-bee.' The typical song of the Carolina is a thinner, higher pitched, four-noted 'se-fee-se-fu,' but I have heard frequent variations, including a two-noted song very similar to some songs of the Black-capped. In the early morning of April 18, 1949, in the Great Smoky Mountains at an elevation of about 2800 feet, I heard a chickadee rapidly repeating a fairly typical Carolina song, and then suddenly it changed to a typical Black-capped song, pitched much lower. It continued this song as it moved rapidly up the slope. From subsequent observations and collections of birds in that area, I suspect that it was a young Black-capped Chickadee that had wintered at that elevation or lower in company with Carolina Chickadees. With one exception, singing birds collected were males; the exception was a solitary female Carolina Chickadee collected on April 20, 1950, that was singing a weak, atypical song.

The call notes of Carolina Chickadees are higher pitched and thinner than those of Black-caps, and the 'dee-dee-dee' note of the former is given more rapidly. This difference in the rate of calls was measured crudely but effectively by counting the individual 'dee' notes as a bird called 'dee-dee-dee- . . .' and continuing counting at the same rate for a total time of five seconds, timing the period by the second-hand of my watch. The count thus obtained was the number of 'dee' notes per five seconds, even though most calls last one second or less, and was a measure of the rate of calling. The mean rate for 179 records of

calls of known Carolina Chickadees was 38.9 (dees per five seconds) with a range from 25 to 52 and a standard deviation of 5.5. The mean rate for 183 records of calls of known Black-capped Chickadees was 23.6 with a range from 17 to 32 and a standard deviation of 2.8. Both species called more rapidly when excited. This method of measuring the rate of calling proved useful in identifying birds in the field.

Behavior.—The behavior of the two species, at least in the Great Smoky Mountains area, differs in one respect; the Black-capped Chickadee is more curious and less timid than the Carolina. Black-capped Chickadees frequently approached me closely and were relatively easily decoyed by squeaking noises or a whistled imitation of their song; Carolinas were more shy or less curious, and I was never able to call them to me.

The nesting habits of the two species are very similar. Most of my observations on nesting chickadees happened to be of Carolinas, and their behavior was essentially similar to that described for the Black-capped Chickadee in New York state by Odum (1941a, 1941b, 1942).

The six Carolina Chickadee nests found were in dead trunks of silverbell trees, *Halesia carolina* L. Nest digging began by April 1 or earlier. Incubation began between April 20 and May 6. At one nest the incubation period was apparently 12 days (May 6 to 18). One nest contained five eggs, another seven, and a third held six young. One pair that was color-banded by being trapped at the nest in 1949 nested in the same stub in a different hole in 1950, and in 1951 they nested again in the second hole. Of a second pair color-banded in 1949, one bird nested in the same territory in 1950, but its mate this year was unbanded.

All four of the Black-capped Chickadee nests observed were in dead trunks of yellow birch, *Betula lutea* Michx., from 5 to 60 feet above ground. Nest digging was observed in late April and early May. Comparison of the dates of nesting of the two species shows that in the Great Smoky Mountains area the Carolinas nest two to three weeks earlier than do the Black-caps.

In the winter both species associated in loose flocks with other small, tree-feeding birds. In the Great Smoky Mountains, Black-capped Chickadees have been observed flocking with Red-breasted Nuthatches, Golden-crowned Kinglets, Downy Woodpeckers, and Tufted Titmice; Carolina Chickadees have been seen with Tufted Titmice and Golden-crowned Kinglets. The two species occasionally join in the same flock. On February 16, 1950, I collected a Black-capped Chickadee from a flock containing Carolina Chickadees iden-

TABLE 2
TAIL TO WING RATIO OF BLACK-CAPPED AND CAROLINA CHICKADEES

	Number of specimens	Mean ratio	Standard deviation	Range	Significance of difference
ALL BLACK-CAPPED	116	.926	.022	.88-1.00	Very significant ($P < 1\%$)
ALL CAROLINA	152	.850	.028	.77-0.92	
BLACK-CAPPED from:					
West Virginia Area*	54	.932	.021	.89-1.00	Not significant ($P = 20\%$)
Great Smoky Mtns.	45	.926	.022	.89-0.97	
Plott Balsams	13	.909	.018	.88-0.94	Significant ($P < 2\%$)
CAROLINA from:					
Great Smoky Mtns.	17	.852	.017	.82-0.88	Not significant ($P = 40\%$)
Western and middle Tennessee and Kentucky	38	.850	.028	.77-0.89	

* The West Virginia area includes the Appalachians of West Virginia, western Virginia, western Maryland, and southwestern Pennsylvania.

tified by their call notes and song. Dr. Alexander Wetmore reported (verbally) collecting a Black-capped Chickadee from a flock of Carolina Chickadees in the Shenandoah Mountains of Virginia in the winter.

The feeding habits of the two species appear to be identical; members of both species feed by gleaning twigs, leaves, buds, and bark for insects. Seeds are occasionally eaten. The stomach contents of all collected specimens contained fragments of small insects.

Evidence of hybridization.—During this study no specimen was examined that could not be assigned to one or the other species. No obvious hybrids were found. Evidence of hybridization was looked for in another way—by seeing if populations of either species adjacent to populations of the other showed any trend in measurements towards those of the opposite species. The tail-wing ratio, being the most consistent difference between the two species, was used for this test. The data are presented in Table 2.

The tail-wing ratio of Black-capped Chickadees from the Great Smoky Mountains, an isolated population of this species surrounded by Carolina Chickadees, is less than that of Black-capped Chickadees from West Virginia and neighboring areas (southwestern Pennsylvania, western Maryland, extreme western Virginia) which are not an isolated group, but there is no statistical significance to the difference. There is then no acceptable evidence of hybridization having affected the characteristics of the Black-caps in the Great Smoky Mountains. This is especially interesting as the Black-caps from this area average smaller than do those from the West Virginia area; Table 3, comparing the measurements of wing and tail lengths, shows that with one exception there are significant differences in wing length and in tail length between the birds of these two areas.

TABLE 3
WING AND TAIL LENGTHS OF BLACK-CAPPED AND CAROLINA CHICKADEES
IN MILLIMETERS (SEPTEMBER THROUGH MARCH)

	<i>Number of specimens</i>	<i>Mean length</i>	<i>Standard deviation</i>	<i>Range</i>	<i>Significance of difference*</i>
BLACK-CAPPED, WING—MALES					
West Virginia area	14	65.8	1.55	63-69	Significant (P < 5%)
Great Smokies	13	64.6	1.39	62-66	
Plott Balsams	4	64.5		63-66	
BLACK-CAPPED, WING—FEMALES					
West Virginia area	13	63.6	1.61	61-66	Very significant (P < 1%)
Great Smokies	9	61.3	1.73	59-64	
Plott Balsams	3	61.3		60-63	
BLACK-CAPPED, TAIL—MALES					
West Virginia area	14	61.6	2.21	58-65	Questionable (P = about 7%)
Great Smokies	13	60.3	1.24	58-62	
Plott Balsams	4	58.8		56-60	
BLACK-CAPPED, TAIL—FEMALES					
West Virginia area	13	59.8	1.30	57-62	Very significant (P < 1%)
Great Smokies	9	57.2	2.05	54-60	
Plott Balsams	3	56.7		56-68	
CAROLINA CHICKADEE					
Wing—Males	52	61.9	1.79	59-66	
Wing—Females	37	60.0	1.59	57-64	
Tail—Males	52	52.3	2.86	46-58	
Tail—Females	37	51.2	2.07	48-55	

* The significance of the difference was measured by the *t* test. There were too few specimens from the Plott Balsams for statistical comparison with birds from the Great Smoky Mountains.

A comparison of Carolina Chickadees from the Great Smoky Mountains with others from central and western Kentucky and Tennessee likewise shows no evidence of the former being affected by hybridization with Black-capped Chickadees (Table 2). This does not mean that there is never any hybridization between the two species in this area, but that, even if there is, it has not occurred frequently enough to affect significantly the characteristics of these populations.

A different picture is presented, however, by specimens of Black-capped Chickadees collected from the Plott Balsams, North Carolina, a line of mountains about 20 miles southeast of the center of the Great Smoky Mountains (Fig. 1). Thirteen specimens were available from these mountains—12 collected by Charles F. Batchelder in the winter of 1885-86 and one I collected in June, 1950. The tail-wing ratio of these birds is significantly less than that of the Black-caps of the Great Smoky Mountains (Table 2). These birds do show evidence of what may be occasional hybridization between the two species because they have a tail-wing ratio tending toward that of Carolina Chickadees, discussed in a later section of this paper.

DISTRIBUTION OF THE TWO SPECIES IN THE SOUTHERN APPALACHIANS

The Black-capped Chickadee is found throughout the northern states and north of the United States from coast to coast, while the Carolina Chickadee is only in the southeastern part of the continent. The boundary where the two species meet, as determined from the ranges described by Bent (1946) and omitting the southern Appalachians, runs from northern New Jersey to southwestern Pennsylvania, then across central Ohio, Indiana, Illinois, and Missouri to central or southeastern Kansas. This boundary is not sharply defined, for there is little information about the abundance and even the identity of the chickadees from localities along this line. In the winter-time Black-capped Chickadees may wander southward into the breeding range of Carolina Chickadees.

Black-capped Chickadee.—The distribution of the Black-capped Chickadee during the nesting season in the southern Appalachians is shown in Figure 1. In southwestern Pennsylvania, western Maryland, and northeastern West Virginia, Black-capped Chickadees are found below 3000 feet in elevation. In most of the West Virginia mountains they are found only above 3000 feet. In the Great Smoky Mountains and neighboring mountains in North Carolina they are found almost exclusively above 4000 feet.

Carolina Chickadee.—Throughout the lowlands of the area covered by Figure 1 Carolina Chickadees are common. For this species, Figure 1 shows only the locations of nesting season records that are above 3000 feet elevation in the northern part of the area and above 4000 feet in the southern part. Carolinas are, almost without exception, absent from these higher elevations where Black-capped Chickadees are present. But there are about 14 localities at these higher elevations where Black-capped Chickadees are absent and Carolinas are present. On several of these mountains Carolina Chickadees have been found nesting at or near the tops of the mountains in forests of spruce and northern hardwoods. Here they are rare and widely scattered, compared with their density at low elevations, but the important point is that they do live and nest successfully on some of the higher mountains.

The one area shown in Figure 1 where Black-capped and Carolina chickadee records are from the same area above 4000 feet elevation is the Black Mountains or Mt. Mitchell area of North Carolina. William Brewster visited these mountains before they were logged over and reported (1886) that Black-capped Chickadees were fairly common in the "balsam belt," mingling with Carolina Chickadees along the lower

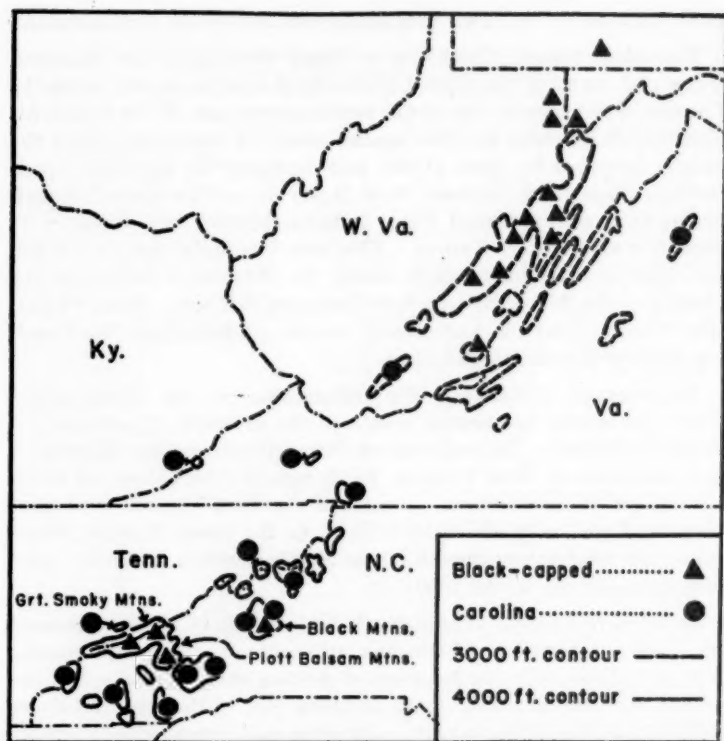


FIGURE 1. Nesting season records for Black-capped and Carolina chickadees in the Southern Appalachians. Locations of Carolina Chickadees are shown only when they are above 3000 feet elevation in the northern part of the map or above 4000 feet elevation in the southern part. Carolina Chickadees are common residents in the lowlands of the area covered by this map. The records indicated on this map are all based upon collected specimens.

edge of this, the spruce-fir forest. This same area was studied extensively by Thomas Burleigh in the years 1930 through 1934, after these mountains had been logged and repeatedly burned over. He reported (1941) Carolina Chickadees at an elevation of 5000 feet; he saw only two Black-capped Chickadees, one of which was collected, on May 8, 1930, and considered these birds to be accidental. In a brief trip to these mountains in June, 1950, I found no Black-capped Chickadees, but did find a pair of Carolinas nesting at an elevation of 4800 feet in a forest of spruce, birch, and other mountain trees.

The presence of Carolina Chickadees on some high mountains where there are no Black-caps and their absence from the higher parts of those mountains where Black-capped Chickadees are present are perhaps evidence for the hypothesis that there is competition between the two species and that in some mountains the Black-capped prevent the Carolina Chickadees from extending their range to the higher elevations. In the Mt. Mitchell area Black-capped Chickadees have disappeared since Brewster's time, and Carolina Chickadees have since invaded the spruce-fir zone. Further evidence for the hypothesis of competition is presented in a later section of this paper.

Absence of Black-capped Chickadees from certain areas.—From the southernmost locality in West Virginia where Black-capped Chickadees are present to the Great Smoky Mountains is a gap of about 200 miles wherein there are, to my knowledge, no records authenticated by collected specimens of nesting Black-capped Chickadees. There are in this gap several mountains containing what appears to be suitable habitat for Black-caps—forests of spruce, fir, birch, beech, and maples where live such northern species of birds as Red-breasted Nuthatch, Golden-crowned Kinglet, Winter Wren, and Junco. There is then no apparent absence of suitable habitat or of climate.

Two hypotheses to explain the absence of Black-capped Chickadees from these mountains are suggested here. The first is based upon the fact that in the Great Smoky Mountains all the nests of Black-capped Chickadees I observed were dug by the birds in yellow birch trees, an abundant tree there. In trips to other mountains where Black-capped Chickadees are absent, I observed that yellow birch trees, although present, are not nearly as abundant as in the Great Smokies. In the Mt. Mitchell area, where Black-caps have disappeared since Brewster's time, mature yellow birch is practically absent, apparently a victim of the logging and repeated fires on those mountains. This hypothesis is, then, that the Black-capped Chickadees of this part of the Appalachians require yellow birch trees for nesting sites and are found only where mature trees of this species are abundant. Although this hypothesis is one of the simplest to explain the disappearance of the birds from the Mt. Mitchell area, it has the apparently unanswerable objection that farther north Black-capped Chickadees use a variety of nesting sites and also use abandoned woodpecker nests and similar cavities (Odum, 1941b; Bent, 1946).

The second hypothesis is that isolated populations of Black-capped Chickadees, when surrounded by Carolina Chickadees, can exist only if their numbers are above a certain minimum; and when their numbers

are below this minimum, hybridization between the two species results in the elimination of the isolated population. The evidence in support of this hypothesis is, first, that the Great Smoky Mountains provide the largest, high, mountain area, supposedly capable of supporting the largest population of mountain birds, in the Appalachians south of West Virginia, as can be seen from Figure 1; and as reported in a previous section, the Black-capped Chickadees found in the Great Smokies show no acceptable evidence of having been affected by hybridization. Secondly, the Black-capped Chickadees of the Plott Balsams, a much smaller area, do show evidence of hybridization between the two species, by tending toward the proportions of Carolina Chickadees.

Hybridization between two species will have a harmful effect on a small, isolated population if any of the three following conditions occur: if matings between the two species are relatively infertile; if hybrids themselves are less fertile than typical members of either species; or if the hybrids are less successful and therefore shorter lived. Any one of these three conditions would result in lessening the reproductive potential of a population, but the effects would be much greater on a small population than on a large, for the proportion of hybridization, or of matings between species to matings within the species, will be greater in a smaller population than in a larger.

To state the second hypothesis: An isolated population of Black-capped Chickadees surrounded by Carolina Chickadees can exist only if the population is above some minimum size; below that minimum, hybridization between the two species occurs often enough to reduce the reproductive potential of the isolated population sufficiently to cause its elimination.

The evidence for hybridization affecting an isolated population is based upon the measurements of the Plott Balsam chickadees, which give no clue as to the frequency of hybridization. And there is no proof that hybridization produces harmful effects. If the hypothesis were proven to be true, then it could be said that south of West Virginia only the Great Smoky Mountains are large enough to support a population of Black-capped Chickadees, except for the Plott Balsams where the population is apparently just above the minimum size, that several other mountains are too small even though they have suitable habitat, and that the Black Mountains of North Carolina formerly held a population of Black-capped Chickadees but that this population was reduced below the minimum size, probably by the adverse effects of logging and fires. All five Black-capped Chickadee specimens that I examined from the Black Mountains were collected in the months of May and June and thus their wing and tail measurements cannot be

used with confidence, but in all of them the tail-wing ratio is at the lower end of the range for the species, possibly indicating that there was a considerable amount of hybridization.

DISTRIBUTION OF THE TWO SPECIES IN THE GREAT SMOKY MOUNTAINS

The distribution of the two species of chickadees in the Great Smoky Mountains was worked out during the winter and spring of 1948, 1949, and 1950. Most of my field work was concentrated on the north-western slopes of Mt. LeConte; trips were made to other areas of the Smokies to see if the pattern of distribution appeared to be uniform, which it did with certain exceptions described later. Mt. LeConte is typical of the Smokies in that its slopes are heavily forested, mostly in virgin forest, and the forest varies from oak-chestnut at the lower elevations to spruce-fir at the summit. As many areas as possible were covered in the early morning, for males of both species sing regularly just at dawn during late winter and early spring, and in the absence of wind and other noises, these songs can be heard for a considerable distance. Singing becomes less regular after sunrise and almost ceases by mid-morning. The regularity of song in the early morning made it possible to decide definitely where chickadees were present, and, in some ways more important, where they were absent. The winter distribution of the two species was worked out by collecting specimens, and collecting was used to check the identification of questionable individuals during the nesting season.

Figure 2 shows the distribution of the two species in a portion of the Great Smokies. Nests of Black-capped Chickadees have been found from an elevation of (rarely) 3400 feet to the tops of the mountains. On the same mountains where Black-caps are present, Carolina Chickadees nested up to an elevation of about 2800 feet. This left a gap of about 600 feet in elevation between the two; on the comparatively steep slopes of Mt. LeConte this is a distance of about one mile. An estimated 35 miles were walked during the nesting season in this gap, much of this in the early morning, without finding any chickadees there. In the winter Black-caps moved down the slopes as low as 2000 feet, thus mingling with Carolinas which wintered in their breeding range. Occasionally Carolina Chickadees wandered to higher elevations in wintertime, shown by a specimen collected by Thomas Burleigh near Indian Gap at 5500 feet on November 30, 1930.

Some Black-capped Chickadees remained at elevations of about 3000 feet, which is below their nesting range, until after Carolina Chickadees were nesting and other members of their own species had begun to dig nest cavities. The latest date that this was observed

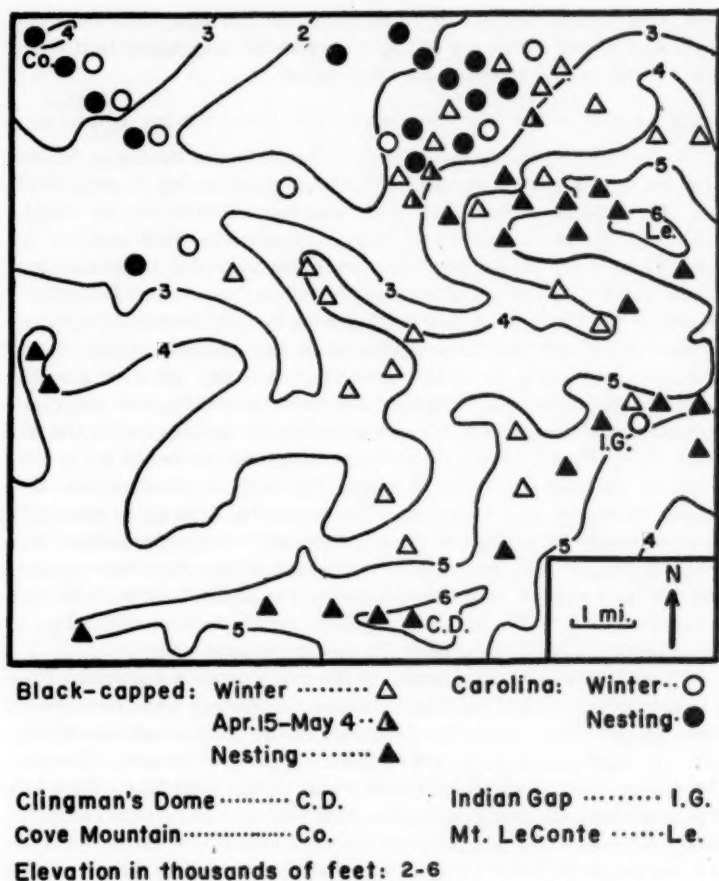


FIGURE 2. Records of Black-capped and Carolina chickadees in a portion of the Great Smoky Mountains of Tennessee and North Carolina.

was May 4. These birds sang regularly in the early morning, frequently were paired, and in general behaved as if they were going to nest. But I never observed them digging nest cavities, and I did not find them at those elevations during or after the middle of May when nesting activities should have been in full swing; presumably they had by then moved higher in the mountains. These birds may have been young of the preceding year, because some of the songs these chicka-

dees sang were not typical; one bird in particular changed from a song sounding like that of a Carolina Chickadee to a typical Black-capped song. I do not doubt the identification of these birds as Black-caps, because the five specimens collected from these elevations proved to be Black-capped Chickadees. The unusual songs were probably learned from Carolina Chickadees by young Black-caps wintering at low elevations.

TABLE 4
COMPARATIVE ABUNDANCE OF CHICKADEES IN EACH FOREST TYPE
IN THE GREAT SMOKY MOUNTAINS*

	Black-capped Chickadees		Carolina
	Nesting season	Winter season	Chickadees All seasons
Spruce-fir	64	28	0
Northern hardwoods	29	56	7
Southern hardwoods	7	16	93

* Based on the number of contacts per mile walked in each forest type. Each contact was counted as a single contact regardless of whether it was with a single bird or a flock. Contacts with Black-capped Chickadees made in the months of May, June, and July were counted as nesting season contacts.

The comparative abundance of the two species in the different types of forest is shown in Table 4. During their nesting and post-nesting season, Black-capped Chickadees are most abundant in the spruce-fir forest (red spruce, *Picea rubens* Sarg.; southern balsam fir, *Abies fraseri* (Pursh) Poir.; yellow birch, *Betula lutea* Michx.). In winter they are commonest in northern hardwoods (yellow birch; beech, *Fagus grandifolia* Ehrh.; sugar maple, *Acer saccharum* Marsh.; frequently with hemlock, *Tsuga canadensis* (L.) Carr.), probably because of movement down the mountains. Carolina Chickadees in the Smokies are practically confined to two or more forest types here combined and designated as southern hardwoods (tulip tree, *Liriodendron tulipifera* L.; yellow buckeye, *Aesculus octandra* Marsh.; silverbell, *Halesia carolina* L.; chestnut, *Castanea dentata* (Marsh.) Borkh.; various oaks; frequently with pines). Just as nesting Black-capped Chickadees become scarcer and more widely scattered toward the lower limit of their nesting range, nesting Carolina Chickadees become scarcer toward the upper limit of their nesting range. In an area near Knoxville, Tennessee, about 30 miles from the Smokies, the distance between centers of eight adjacent territories of Carolina Chickadees averaged less than one-quarter mile, while at the upper edge of the nesting range of Carolinas in the Smokies this distance for four territories averaged almost one-half mile.

The above discussion of the distribution of the two species in the Great Smokies has considered only mountains like Mt. LeConte where

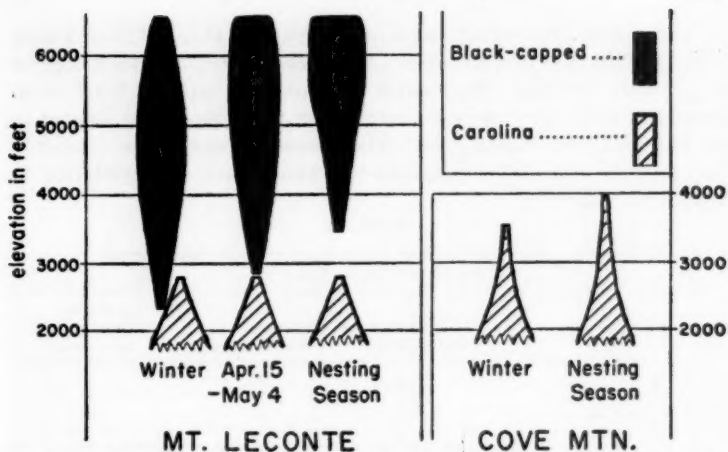


FIGURE 3. Diagram of altitudinal distribution of chickadees on two different mountains in the Great Smoky Mountains. The width of each symbol approximates the relative abundance of the chickadees at the different elevations.

both species are present. The situation is different wherever Black-capped Chickadees are absent. This is illustrated by conditions on Cove Mountain, about eight miles west-northwest of Mt. LeConte (Fig. 2). The summit of this mountain is just above 4000 feet in elevation. The forest on Cove Mountain is similar to that on Mt. LeConte at comparable elevations and exposures. Black-capped Chickadees were absent from Cove Mountain, and Carolina Chickadees were found to the top of the mountain in summer and up to at least 3700 feet in winter. This relationship agrees with that described earlier for the entire southern Appalachian region—that Carolinas are found at higher elevations wherever Black-caps are absent.

The distributions of the two species on Mt. LeConte and Cove Mountain are diagrammed in Figure 3 which graphically shows the changes occurring between winter and nesting seasons and the differences between the two mountains.

Competition affecting the distribution of Carolina Chickadees.—The distribution of the two species on mountains like Mt. LeConte may supply further evidence for there being competition between the two. The Black-capped Chickadees inhabit the higher parts of the mountain. As shown by Table 4, they were most abundant during the nesting season in the spruce-fir forest at the top, but nesting birds were found downwards in smaller numbers to elevations of about 3400 feet

on Mt. LeConte, which is in the upper edge of the southern hardwoods. It seems that they are better adapted to some conditions found at the higher elevations; the question of what limits their downward distribution is discussed in the following section.

During the winter Black-capped Chickadees moved down to lower elevations, some of them mingling with Carolina Chickadees. As the nesting season approached the Black-caps withdrew up the slopes, but some remained behind, as described above, and behaved as if they were going to nest at elevations of about 3000 feet. About May 1 or soon after, these Black-caps disappeared from these places.

On Mt. LeConte, Carolina Chickadees were not found nesting above 2800 feet. There is ample evidence that the habitat does not limit their upward distribution. On several mountains outside the Smokies where Black-caps were absent, Carolinas were found nesting at elevations of almost 5000 feet in northern hardwoods, spruce, and similar trees, and on Cove Mountain, only a few miles away from Mt. LeConte, Carolinas were found on the 4000 foot summit (Fig. 1). Their upward limit was apparently determined by the presence of Black-capped Chickadees at elevations of around 3000 feet during the early part of the Carolinas' nesting period. Even though the Black-caps did not nest this low, they did not withdraw from these elevations until after May 1, when Carolina Chickadees were laying or incubating. This resulted in leaving on Mt. LeConte a gap of about 600 feet in elevation (2800 to 3400) in which no nesting chickadees of either species could be found. There is, then, this evidence for competition between the two species, in which the Black-capped Chickadee is the dominant or successful species at higher elevations since its presence determines the absence of nesting Carolina Chickadees at these elevations. The evidence indicates that the competition exists during the early nesting season or at the time territories are established, because the two species will mingle in winter flocks, and because of the sequence of events resulting in a gap in elevation between the nesting distribution of the two species. The fact that Black-capped Chickadees are larger than Carolinas may be significant. Despite the many hours I have spent looking for and watching chickadees, I have never observed any kind of interspecific conflict, display, or territorial defense in these species.

Some observations which are interesting, but do not shed much light on the problem, were made on April 16, 1950, and were almost duplicated on May 3, 1951. On the earlier date a pair of Carolina Chickadees had a newly completed nest at an elevation of about 2300 feet. Two Black-capped Chickadees, one singing, were found about 40 yards from this nest; I followed them for about 20 minutes as they fed

through the trees, then lost them. They were neither seen nor heard again on this or following days, even though I looked for them several times. Apparently they had just wandered through that area. On May 3, 1951, when the same pair of Carolina Chickadees had a nest with eggs, three Black-capped Chickadees, one singing and the others giving typical calls, were found again about 40 yards from the nest. They moved off and were lost, and I did not see or hear them again in the next two hours I spent in that area. On neither occasion did I see or hear a Carolina Chickadee near the Black-caps; there certainly was no attempt by the nesting Carolina to drive the Black-caps away. This may not be significant because there was no way to tell if the Black-caps were trespassing on the territory of the nesting Carolina Chickadees; there were no neighboring Carolinas so there were no combats to reveal the boundaries of the territory of the male Carolina in question, and there were two other Carolina nests located 30 yards or less from the boundaries of the respective territories.

Why did not the presence of these Black-caps prevent the nesting of Carolina Chickadees at 2300 feet? In both 1949 and 1950 I was in this area several times before and during the early nesting season, looking for and observing the nest of the Carolina Chickadees there; in 1951 I only drove through the area a few times during this season. The two incidents described above were the only times when Black-caps were observed anywhere in this vicinity. In contrast, at this same time of the spring, Black-caps were found repeatedly at elevations of around 3000 feet, behaving as if they were on their territory until they disappeared about the first week of May, and it was in these areas that no Carolina Chickadees were found nesting. The observations made at 2300 feet indicate that the Black-caps seen there were wandering birds, not behaving as territorial birds, and they had no more effect on the resident Carolinas than the Black-caps that winter as low as 2000 feet.

Lower limit to the distribution of Black-capped Chickadees. The presence of Black-capped Chickadees apparently determines the upper limit of Carolina Chickadees in the southern Appalachians, but there remains the question of what determines the lower limit of the Black-capped Chickadees. What keeps them from nesting farther down the slopes of the mountains than they do? The fact that many Black-caps remained at lower elevations until about the first of May, and then disappeared from there, probably moving farther upwards, indicates that whatever factor determines their lower limit operates at about this time of the year. Three possible answers to this question were investigated, all with negative results; they are summarized below.

Because all of the nests of Black-capped Chickadees I found in the Great Smoky Mountains were in yellow birch trees, it seemed possible that the lack of this kind of tree or of a suitable substitute at lower elevations limited their nesting distribution. Yellow birch trees, however, are found along streams at elevations considerably below the lowest nesting Black-capped Chickadees. A further test of this idea was the placing of 24 nest boxes, of a kind suitable for chickadees, at various elevations from 2600 to 6000 feet with the largest number below 4000 feet. Some of these boxes remained up through three nesting seasons. None of these boxes were used. One pair of Black-caps nested in a yellow birch stub within 70 feet of a nest box.

Temperature is a factor that might limit the distribution, and a test of this was made by searching for a temperature condition that was the same for the southern limit of the distribution of Black-capped Chickadees in non-mountainous areas (see the description of the range of this species in an earlier part of this paper) and for the lower limit of their nesting range in the Great Smoky Mountains. A fair number of temperature data was available for this comparison; several kinds of measurements were investigated, such as the average daily maximum dry bulb and wet bulb temperatures for both the beginning of the nesting season and the hottest time of the year, extremes of high temperature, duration of hot weather, etc. In none of these was the correlation between temperature and the limits of the nesting range close enough to show that temperature determined the limit of the range.

On the northwestern slopes of Mt. LeConte, where most of the field work in the Great Smokies was done, the lower limit of Black-capped Chickadee nests coincided with the upper limit of Tufted Titmouse nests, suggesting competition between these two species. This idea is contradicted by the large overlap in the ranges of the two species in non-mountainous areas, *e. g.*, the Great Lakes area.

SUMMARY

The Black-capped and Carolina chickadees are closely related species that are similar in appearance and habits but which have fairly constant differences in measurements, plumage, and voice. Hybridization, if such actually occurs, is so rare as to have little effect on the characteristics of either species except for small, isolated populations such as the Black-capped Chickadees of the Plott Balsams, North Carolina; here hybridization may have occurred often enough to change the characteristics of the Black-caps of these mountains.

In the southern Appalachians, Black-capped Chickadees are found in the mountains of West Virginia nesting mostly above an elevation

of 3000 feet and in the Great Smoky Mountains and the neighboring Plott Balsams nesting mostly above 4000 feet. They are more abundant at higher elevations, apparently being better adapted to conditions found there. Carolina Chickadees are found at lower elevations; they do not nest at higher elevations wherever Black-capped Chickadees are present; but where the latter are absent, Carolinas nest sparsely as high as 5000 feet. In the Great Smoky Mountains there is a gap between the nesting range of the two species, wherein neither one nests. In the spring, this gap is occupied by Black-capped Chickadees which behave as if they are going to nest, but which disappear from these areas about the time that Carolina Chickadees begin incubation. These facts indicate: 1) that there is some form of competition between the two species, that operates during the early nesting season; and 2) that the presence of Black-capped Chickadees prevents the Carolinas from inhabiting the higher parts of these mountains.

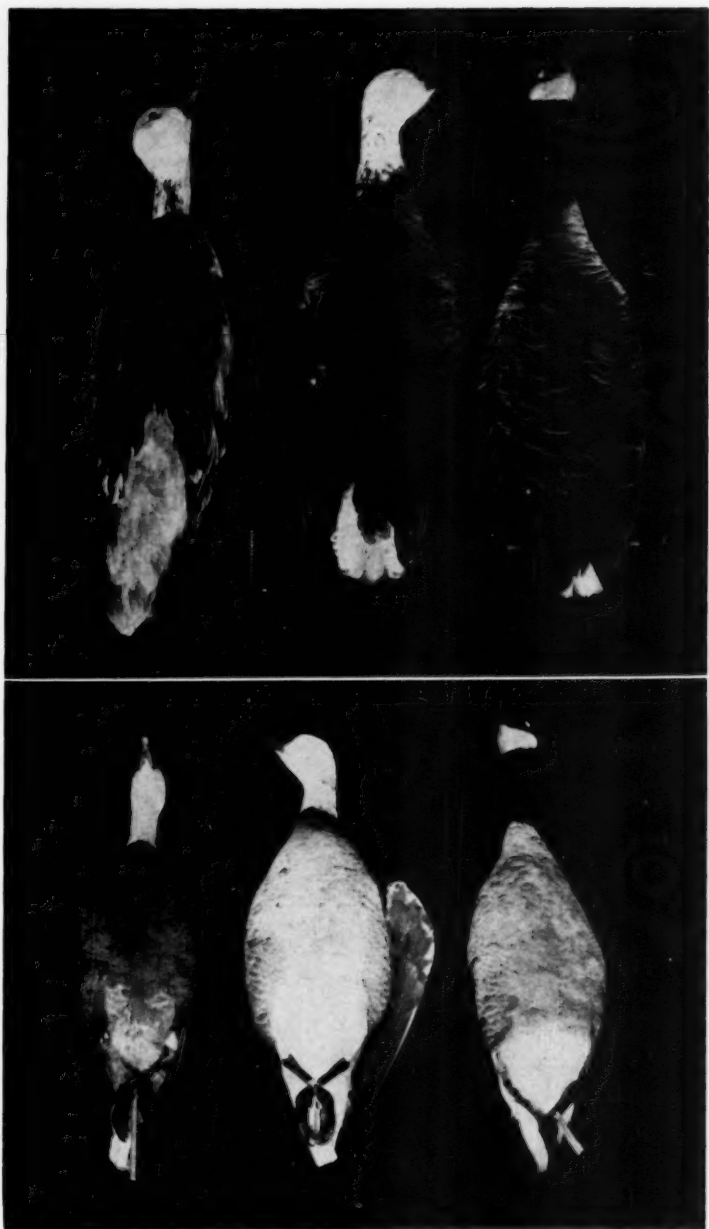
Why Black-capped Chickadees are absent from certain mountains that appear to possess suitable habitat and the problem of factors determining the lower limit in the mountains of the nesting range of Black-capped Chickadees are discussed. Satisfactory answers to these problems were not found.

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Contribution No. 47, Department of Zoology and Entomology, University of Tennessee, Knoxville, Tennessee, March 2, 1951.





Comparison of Canada Goose-Blue Goose hybrid (center) with typical Blue Goose (left) and Richardson's Goose (right). (Top) Dorsal view. (Bottom) Ventral view. Photographs by Harvey L. Gunderson.

HYBRIDIZATION OF CANADA GEESE WITH BLUE GEESE IN THE WILD

BY HARVEY K. NELSON

While carrying out hunter bag checks in the vicinity of Sand Lake National Wildlife Refuge, Columbia, South Dakota, during the 1950 waterfowl hunting season, the author examined two adult male geese which proved to be crosses between one of the smaller Canada Geese (possibly Richardson's Goose, *Branta canadensis hutchinsi*) and the Blue Goose, *Chen caerulescens*.

The hybrids were killed by hunters along the southeast boundary of the refuge on November 1 and 6, respectively. One was reported to have been shot from a flock of mixed Snow Geese (*Chen hyperborea*), Blue Geese, and Canada Geese, while the composition of the flock from which the second hybrid was killed could not be determined. The first bird was prepared as a study skin for the refuge collection (SLR No. 5). The second bird (MMNH No. 9763) was sent to the Minnesota Museum of Natural History, University of Minnesota, where Dr. W. J. Breckenridge and Dr. D. W. Warner of the museum verified the author's identification.

A third bird shot on November 8 was believed to be a Canada Blue goose hybrid, however the hunter would not release the bird for positive identification.

A fourth oddly colored goose with a white head and black and white neck was observed by the author at close range on several occasions from November 22 to December 5. The flight of the bird indicated that it had suffered a wing injury. This individual was with a group of approximately 400 Canada Geese together with a few crippled Blue and Snow geese. The bird closely resembled the two hybrids identified, and it is believed that the coloration was not a case of white spotting (Hanson, 1949), a condition which has been noted in Canada Geese at Sand Lake Refuge.

The author wishes to acknowledge the assistance of Dr. W. J. Breckenridge, Dr. D. W. Warner, Dr. W. H. Marshall, Dr. James Beer, Mr. C. T. Rollings, and Mr. J. H. Stoudt in verifying identification and for suggestions offered in the preparation of this paper. Photographs were taken by Mr. Harvey Gunderson of the Minnesota Museum of Natural History. Geese were received from hunters, Loel Lust of Aberdeen, South Dakota, and C. J. Gross of Hosmer, South Dakota.

As shown in Plate 10, the plumage of the lighter hybrid (MMNH 9763 center) is in general intermediate between that of Canada and Blue geese. The head and neck more closely resemble the Blue Goose. In shape and color, feathers of the back resemble the Canada slightly more closely. Feathers of the legs and lower abdomen are pure white. The breast and upper belly are lighter than in either of the "parent" species.

The other hybrid (SLR No. 5) is in general much darker than the museum specimen shown in the plate. Feathers of the head and neck are more streaked with black. Breast feathers are dark gray, more like the Canada Goose. Some white blotches appear in the lesser secondary coverts and marginal coverts and the secondaries are edged in white as in the Blue Goose. Feathers of the legs and lower abdomen are predominantly white, streaked with brownish-gray.

The scapulars and inner greater coverts of both hybrids are broad and rounded, not plume-like as in the Blue Goose. Rectrices are predominantly black as in the Canada Goose. The bills of both hybrids appeared dark with pink streaks when examined shortly after death. The "grinning patch," so prominent on sides of the mandibles of the Blue Goose, is barely evident in the hybrids, although the upper and lower mandibles do not appear to close fully as do those of the Canada Goose. Color of feet in general was intermediate between black as in the Canada Goose and pink as in the Blue Goose.

Weights of the hybrids (4 lbs. 15 oz. and 5 lbs. 7 oz.) are near the average weights of male Blue Geese (5 lbs. 5 oz.) or Richardson's Geese, *B. c. hutchinsi* (4 lbs. 4 oz.) and much less than average weights of Common Canada Geese, *B. c. canadensis*, which vary from 8 lbs. to 13 lbs. 8 oz. Average total length of 711.2 mm for the two hybrids is near that of 721.4 mm for the Blue Goose or 621.5 mm to 728.9 mm for Richardson's Goose, and much less than 944.9 mm for the Common Canada Goose.

Internal examination of one hybrid by Dr. Warner revealed that the bird was an adult male, the bursa being very small and shallow (12 by 3 mm) and testes well developed (about 12 by 5 mm).

In literature available, no records of Canada Goose-Blue Goose crosses were reported as having occurred in the wild. Waldo L. Schmitt of the Smithsonian Institution states that Dr. Herbert Friedmann informs him that there appear to be no legitimate records of wild Canada-Blue crosses (pers. corres.—March 15, 1951).

Soper (The Blue Goose, Dept. of Interior, Ottawa, Canada, 1930) states that large numbers of Richardson's Geese associated with mixed companies of Snow and Blue geese at the Blue Goose breeding ground

at Bowman Bay, Baffin Island. Through personal correspondence (April 3, 1951) he states that he witnessed no interbreeding of Richardson's Geese with Blue Geese during his studies on the Blue Goose breeding grounds. His observations revealed that the scattered groups of Richardson's Geese in that area kept to themselves. Because the two species do come in close contact on portions of the breeding grounds, it is possible, however, that such a cross as reported could occur there.

One successful cross of a male Blue Goose and female Canada Goose, *Branta canadensis*, at the zoo in Red Lodge, Montana, in 1943 produced four young, of which one survived. The following year the male Blue Goose mated with another female Canada Goose and two young were reported to have survived (Davis, Auk, 62: 636, 1945). In both cases the juveniles more closely resembled the Canada Goose, but at about seven months of age the neck and ventral surface of the body became speckled with white. As adults the hybrids are said to have shown a combination of behavior and characteristics of both parents.

The fact that Blue Goose-Canada Goose crosses do occur in the wild is not surprising as more than 63 species of ducks from different parts of the world as well as geese and swans, have been listed as cross breeding in the wild state (Kortright, The ducks, geese and swans of N. Amer., Amer. Wildl. Inst., Wash. D. C., 1942). The frequency of such occurrences is of greater interest. Dr. Ernst Mayr (pers. corres., Feb., 1951) states that the identification of two such hybrids, each shot on a different location on different dates in one area during one season may indicate a much higher frequency of occurrence than expected.

Bag check figures for the 1950 waterfowl hunting season in the vicinity of Sand Lake Refuge show that 2508 geese of four species were examined by Fish and Wildlife Service personnel and South Dakota Game Technicians. Of this total, 1985 were Canada Geese (mainly Richardson's) and 72 were Blue Geese. Considering only the Canada Geese and Blue Geese checked, the occurrence of two hybrids gives an approximate frequency of 1 in 1029. If the third and fourth possibilities were also such hybrids, the frequency would be even greater. However, with these being the only such reported hybrids out of all the wild geese ever shot or observed closely, the suggested frequency ratio seems much too high. There is the possibility of course that similar hybrids have been shot, but plumage characteristics may have caused such birds to be identified as Blue Geese.

Since the two specimens obtained were adult males—birds in their

second year or older—the evidence indicates that the hybrids obtained, and one observed, were not of a family group even though killed in areas about two miles apart during a 6-day period.

It is also important to consider the fact that the hybrids obtained were associated with approximately 10,000 Snow and Blue geese and 35,000 Canada Geese (mostly *B. c. hutchinsi*).

The frequency of such crosses in the wild is difficult to determine without more knowledge of the breeding habits of the two species and the extent to which breeding ranges overlap, as well as more detailed examinations of a larger number of geese.

U. S. Fish and Wildlife Service, Sand Lake Refuge, Columbia, South Dakota.

BIRDS ON THE GULF OF MEXICO

BY GEORGE G. WILLIAMS

It was long assumed that birds seen over the Gulf of Mexico in spring were making a trans-Gulf migration. I tried to show (Williams, 1945, 1947, 1950b) that evidence indicates that the spring migrations normally pass around the Gulf of Mexico, not across it, and that large numbers of birds seen over the Gulf in spring have been driven there by adverse weather.

Bullis and Lincoln (1952) described a heavy concentration of land birds observed from the U. S. Fish and Wildlife Service's *M/V OREGON* 60 miles off the Louisiana coast, from 9 o'clock till dawn on the night of April 6-7, 1951. They stated (p. 37) "In the opinion of the authors the observations recorded here provide definite evidence of a heavy trans-Gulf migration between the Yucatán Peninsula and the coast of Louisiana."

These authors have omitted so many pertinent data that their observation deserves re-examination and re-interpretation.

1. Among other birds captured on the *OREGON* was a Vermilion Flycatcher, *Pyrocephalus rubinus*. This species breeds in the United States far to the west of where it was captured, and it would have no reason for making a trans-Gulf flight to Louisiana. A few scattered individuals, however, winter along the coasts of Texas and Louisiana. It would seem likely, therefore, that the individual captured on the *OREGON* came from north or west of its point of capture, and that it was not migrating across the Gulf.

2. Purple Martins (*Progne subis*), Tree Swallows (*Iridoprocne bicolor*), and another species of swallow were observed on or about the

boat that night. But all our swallows are normally *daytime* migrants (Lincoln, 1950: 16). Thus it seems doubtful whether any of these swallows seen late at night over the sea were migrating normally.

3. They also state (pp. 35-36) "Owing to . . . the criss-cross movement of the birds, it was difficult to obtain a true bearing on the direction of flight, but the whole movement was in north-northwesterly direction." Moreover, "The flight was so dense that it is difficult to see how an application of the technique described by Lowery in his lunar studies of bird migration could have been applied" (p. 37). Finally, there is a notation on page 35 about ". . . the din caused by the continuous peeps of the smaller birds" and the quacking of ducks. All this suggests a multitude of birds lost or confused. It does not suggest a normal, orderly migration.

4. Bullis and Lincoln stated that they had studied the weather data for the April 3-7 period, and concluded (p. 38) that ". . . the general climatic conditions were not unusual." It is difficult to conceive how they arrived at this conclusion.

The facts, easily verifiable from the records of the United States Weather Bureau, are these:

From Galveston to New Orleans throughout the afternoon of April 6, a low, heavy overcast obscured the sky. The humidity ranged from 94 per cent to intermittent drizzle and rain everywhere along the coast. The barometer was falling steadily. In the evening, thick fog gathered from Galveston eastward along the Louisiana coast. Early in the evening a squall line formed in western Louisiana and moved eastward across the entire Louisiana coast. It was accompanied by lightning, thunder, rain, and gusts of high wind. According to the weather map, this squall line extended about 50 miles out into the Gulf, and thus fell just short of the place where the *OREGON* lay. The rain on the Louisiana coast directly opposite the *OREGON'S* position was almost continuous during the evening, and fairly heavy (more than an inch). The night was absolutely moonless.

Meanwhile, a cold front from the northwest was moving toward the coast, and struck it shortly before midnight. Though this front was not severe, temperatures along the coast dropped more than 10° in the next 24 hours, and it brought north winds up to 24 miles per hour.

Of all these facts, Bullis and Lincoln barely mention two: that there was little or no sunshine along the coast on April 6, and that precipitation along the coast ". . . was very small, being only a trace at some stations" (p. 38).

Though Lincoln (1950: 80) has held that migrations are little affected by weather, most other ornithologists think that weather has a

vital influence on migration (see, for example, Bagg *et al.*, 1950; Gunn and Crocker, 1951; Lowery, 1945; Robbins, 1949; Williams, 1950a). To me it seems beyond question that the rather remarkable accumulation of bad flying conditions along the Louisiana coast on the evening of April 6 could have affected coastwise migration.

Many of the birds seen about the *OREGON* belonged to species well known to be largely, or perhaps exclusively, coastwise or overland migrants. These were Purple Martins, two species of swallows, Common Nighthawk (*Chordeiles minor*), Roseate Spoonbill (*Ajaia ajaja*), and the Vermilion Flycatcher (a coastal winter resident that has never previously been mentioned as a trans-Gulf migrant). The fact that so many migrants of this type were present in such numbers indicates that they were not casual strays. All this evidence suggests that the birds seen were coastwise migrants that had been forced out to sea by the fog, rain, and squalls along the Louisiana coast. They accumulated in a dense aggregation ahead of and out beyond the end of the squall line, just where the *OREGON* lay.

Even though the relatively local weather conditions on the Louisiana coast were sufficient to account for the presence of the birds about the ship, we must not discount the effects of the cold front approaching the coast. Elsewhere (Williams, 1950a: 57-59) I have mentioned examples of spring migrants retreating southward several hours ahead of cold fronts.

From April 4 to the night of April 6, 1951, an unseasonable warm spell, with temperatures up to 90°, light southerly winds, and clear skies prevailed in southern Texas and eastern Mexico. Undoubtedly, multitudes of migrants followed the warm wave northward into Texas and Louisiana. When they encountered, or became aware of, the cold front that lay about 50 to 75 miles from the coast on the afternoon of April 6, they probably retreated toward the coast according to a regular pattern of migratory behavior (Williams, 1950b). In the coastal region on this particular afternoon and evening they found unusual weather conditions: the low overcast, rainy weather, fog in the early evening, squalls, and complete darkness by sunset. Caught between the approaching cold front and the bad weather of the coast, they became lost and confused. At any rate, the aimless criss-crossings of their flight, their cries, their low-altitude flying, their attraction to the lights of the *OREGON*, the displacement of swallows from their normal migration hours, the displacement of several species from their normal coastwise migration route, and the presence of the Vermilion Flycatcher, a western species, strongly suggest lost birds.

Similar invasions of the Gulf by birds retreating before cold fronts

have been described fairly often. Joseph C. Howell described one (Lowery, 1946; Williams, 1947). Dufresne (1947) described a small invasion accompanying a remarkable double front (Williams, 1950a: 62-63). Packard (1947) described several invasions in the spring of 1943. Packard did not record the dates of his observations, though he saw a large number of birds "one morning in May." Through the U. S. Maritime Board, I found that Packard's vessel crossed the Gulf on these dates in 1943: March 17-22, April 5-11, April 15-19, May 7-11, May 14-19. The first date is too early for major migrations; and I find no unusual weather conditions for the second crossing, or for the last. But it happens that the very worst weather of both April and May fell in the remaining two periods. These were periods when cold fronts, strong northerly winds, low temperatures, and rains occurred all along the Texas and Louisiana coasts, and large concentrations of migrant land birds appeared on the Texas coast. Presumably, some of the birds retreating southeastward before the cold fronts overshot the coast and were observed at sea the next morning—like those seen by Bullis at night.

For several years during the 1940's Mr. E. P. Romain, Chief Officer of a Standard Oil tanker plying regularly between Gulf ports and ports on our north Atlantic coast kept records of land birds observed aboard his ship. He sent these records to Mr. Richard Pough, of the National Audubon Society, who kindly lent them to me. Birds came aboard Mr. Romain's vessel in both spring and autumn, when his ship was in the Atlantic all the way from the latitude of Florida to that of New York, and from 40 to 200 miles at sea, where there was no possibility of a trans-oceanic migration. They appeared also on the Gulf of Mexico, but no more commonly than on the Atlantic. Mr. Romain correlated each of his observations with weather phenomena, and came independently to the following conclusion: "I am inclined to believe that the birds try to follow courses over land, and that those we see on ships have been blown off their routes by contrary winds."

This most recent record, by Bullis and Lincoln, of large numbers of birds over the Gulf of Mexico is interesting, but adds little to what was already known about this class of phenomena. Interpreted in relation to *all* the available facts, it merely contributes additional evidence that spring migrants may be forced southward over the Gulf of Mexico by bad weather coming from the continental United States.

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NESTING OF HICKS' SEEDEATER AT BARRO COLORADO ISLAND, CANAL ZONE

BY ALFRED O. GROSS

HICKS' SEEDEATER, *Sporophila aurita aurita* (Bonaparte), more recently designated as the Variable Seedeater, is a bird characteristic of the grasslands of tropical America. Its range extends from Costa Rica to Colombia, South America. It is a very abundant bird in the Canal Zone where it may be seen in large numbers in the grassy areas bordering the canal and Gatun Lake, as well as along much of the 47 miles of the railroad and highway between Cristobal and Panama City. It nests in tall grass and weeds and in shrubs and small trees. It has also invaded the towns and cities, where it may be found nesting in parks and close to the habitations of man.

This little seedeater is now a well established nesting bird on Barro Colorado, an island which over most of its 3,840 acres is covered by a lush tropical rain forest. It is not in general the kind of a place where one would expect to find a bird characteristic of the open country and grasslands to thrive and continue as a successful species. Barro Colorado was set aside as a reservation in 1923 so that its luxuriant vegetation and wealth of wildlife would be preserved for scientific study. An area of approximately 2.5 acres of the jungle was cleared about the laboratory buildings and planted with Bermuda grass in 1924. It is in this relatively small cleared area that Hicks' Seedeaters have established themselves on Barro Colorado Island.

When I visited the island from June to August, 1925, I did not see any of these birds, and I doubt if any of them had arrived at that time. During a second visit, in 1927, the Seedeaters were there in numbers. In paddling along the shore of the open area in a canoe one could see many of them riding on the long swaying stems of the tall grasses, busily engaged in feeding on the seeds which are their chief source of food. During the month of September, 1927, I found seven of their nests in the grass, weeds, and small shrubs of the lower level of the clearing, near the lake and remote from the laboratory buildings. At that time no other representatives of the Fringillidae were found nesting in the area occupied by the Hicks' Seedeaters. Since 1927 other species such as the Yellow-bellied Seedeater (*Sporophila nigricollis nigricollis*), the Panama Buff-throated Saltator (*Saltator maximus intermedius*) the Green-backed Sparrow (*Arremonops conirostris striaticeps*) and others have been noted in the clearing but never in large numbers. The abundance of Hicks' Seedeaters

has been noted at Barro Colorado by many observers since 1927, and it has now become an important member of the assemblage of birds to be seen in the clearing about the laboratory. The sweet and varied songs of the males are a conspicuous part of the chorus of calls and notes that may be heard throughout the day but especially during the early morning hours. On Barro Colorado the Hicks' Seedeater finds strange company among such birds as parrots, motmots, trogons, tinamous, and manakins. It is not unusual to see 50 to 60 different species during the course of a single day. Mr. Eugene Eisenmann has listed more than 150 species that have appeared in the clearing or the trees bordering the small area. Even the black howlers and white-faced monkeys are frequent visitors and form a part of the environment to which these seedeaters have come. The Hicks' Seedeater, like many of the other members of its group, is an adaptable species. It has successfully met all competition and has made itself an integral part of this unusual and complex association.

When I arrived at the island in June, 1949, these seedeaters were not only in the part of the clearing bordering the lake, which they occupied in 1927, but had invaded the area close to the laboratory. On June 29 a nest in the final stages of construction was found in an orange tree within a few feet of the main laboratory building. The tree grew on the steep slope of the hill on the northern side of the laboratory. The nest, though 26 feet above the base of the tree, was on the level of the first floor of the building and thus presented ideal conditions for observation.

Only the female was concerned with the building of the nest and while she was busily engaged two males were present and spent much of their time fighting and pursuing one another.

There is a marked difference in the coloration of the sexes. The female is a plain olive color above, much paler below, the abdomen is more or less white or a very pale yellow. The males are predominantly black with contrasting white markings. There is a considerable variation in the amount of white in different males and this difference was striking in these two males. One had much white on the chin, throat, sides of neck, underparts, and axillars; the other was of the so-called black-throated phase (Ridgway, 1901) in which the chin, throat, and rump were black, and the white on the neck and abdomen greatly reduced. The whole coloration of the latter gave the impression of a decidedly black individual. Because of the marked difference in the coloration of the two males they were readily identified and are designated in the following account as the dark and the light male, respectively. The variation in the color of different males has given origin to the very apt name, Variable Seedeater.

On June 30, 1949, the light male was seen to approach the female where she was perched on a lower branch of the orange tree containing the nest. The male flew from limb to limb, fluttering and circling about the female many times, but she seemed quite indifferent to his presence and ignored his attentions as she meticulously preened and adjusted her plumage. After about ten minutes the female flew to a nearby tree, the male pursuing her closely from branch to branch; the pursuit finally ended in the act of copulation. The light male then flew to the top of a lime tree and immediately began singing. This tree later proved to be his singing tree throughout the season. The dark male was not around at that time, but the challenging courtship song of the light bird apparently attracted the dark male which suddenly appeared in a Pitanga bush where he answered his rival with a similar vocal performance. About a half-hour later the female again alighted on the lower branch of the nesting tree. Both males immediately joined her and each went through its maneuvers, taking turns in alighting on the branch where the female was perched. Both the males were ignored and when either male approached too closely she half spread her wings and thrust her opened beak at them, causing them to dash aside. The two males were extremely active, highly excited, and flew in pursuit of each other or fluttered above or around the female. The light male finally flew at the dark male and they met in mid-air, fighting and vigorously fluttering their wings as they fell to the ground.

The next day, July first, I saw the dark male copulate with the female, and this was the first positive evidence that here was a definite case of polyandry. The female had accepted both males. That it was the same female was certain because each time after the act she flew to arrange materials at the nest near the top of the orange tree. I have no reason to believe that polyandry is a common practice among these seedeaters. A check on the Barro Colorado seedeaters revealed an excess of males in a ratio of about 2.5 to 1. On July 7, I found a newly-built nest in a lime tree near the lake on Barro Colorado Island where I saw two and, at one time, three males near the nest. Unfortunately this nest was destroyed before there was an opportunity to observe whether this female had mated with more than one male.

The nest in the orange tree was completed by July 1; the female nevertheless made frequent inspection trips to the nest but brought no nesting materials. She seldom remained for more than a few minutes, but during these visits she would arrange certain fibers as she fitted her body into the bowl and carefully molded it to the proper shape. During much of this time the two males were in their respective singing trees giving their challenging songs.

THE SONG

The song of the males is a complicated but pleasing series of musical notes. The songs vary in quality as well as in the number of notes uttered. One interpretation of the song which I made on July 4, 1949, was *Chee-a, chee-a, chee-a tweet, o-wee, tweet o-wee, tsche, tsche, tsche, tsche—tookee! tookey! tookey!* The last *tookee* notes were frequently omitted. The whole song is rather rapid, the first notes are loud, rather high pitched, and followed by a kind of warble somewhat suggestive of certain notes uttered by the Indigo Bunting. At times the males uttered the introduction alone without the following musical portion. The time required to utter the different versions was from two to four seconds. The complete songs were given four to six times a minute. Representative intervals between songs in seconds for a four-minute period are as follows: 12, 9, 13, 11, 8; 11, 13, 20, 14; 9, 13, 9, 8, 14, 9; and 14, 21, 12, 19. These records indicate the frequency and persistence of the singing by the males during the height of the nesting season. The singing usually started at dawn and ended at sunset. I never heard them singing at night. The frequency varied and sometimes no singing was heard for several hours. They were not heard during the torrential downpours of rain which were frequent during this, the rainy season. The heat of mid-day did not seem to influence their singing, but the presence and the challenging song of the other male did seem to make a difference. The birds when disturbed utter a loud, clear, high-pitched *tsleep, tsleep, tsleep* frequently repeated. The female gives a similar note at times, especially on being disturbed, as when I climbed the tree to examine the contents of the nest. Singing by the males did not cease at the time of the hatching of the young as it does in the case of certain other birds. In the case of the two males of this nest it increased in frequency and intensity over what it was near the end of incubation.

INCUBATION

The first egg of the nest in the orange tree, chosen for detailed observations, was laid on the morning of July 3. On July 4, the female was seen to go on the nest at 9 a. m. and to leave at 11. When I visited the nest a few minutes later there were two eggs, a complete set. On July 5, the female was on the nest each time during my many visits throughout the day, and it was obvious that incubation had begun. During the first day only the light male was seen in the vicinity of the nesting tree. The next morning I saw the light male copulate with the female. In the afternoon the dark male was again seen and both males attended the female each time she was seen away

from the nest. At times when the female was incubating her eggs the males occupied their singing trees. The males sometimes exhibited evidence of defending their territory by chasing such birds as the Honey Creepers, *Cyanerpes cyaneus cyaneus*, and Bananaquits, *Coereba mexicana mexicana*, whenever these smaller birds alighted in their singing trees. However, they seemed to pay little attention to the larger birds such as the Streaked Flycatcher (*Myiodynastes maculatus nobilis*), the Blue Tanager (*Thraupis cana diaconus*), and the Palm Tanager (*Thraupis palmarum atropennis*) which frequently alighted in the trees, sometimes very near to them. Although both males came to the female when she left the nest and accompanied her on feeding trips, neither male was seen to visit her at the nest. I never saw the males feed the female, as is frequently done by certain other species of Fringillidae.

The female incubated her eggs closely on heavily clouded or rainy days and only left the nest to feed, usually early in the morning and again two or three times later in the day. The two males were very attentive at such times, and as incubation proceeded they seemed to be reconciled to each other's presence and less fighting occurred. The following notes were made on July 13 when the eggs had been incubated for eight days: 6:00 a. m., there is a beautiful colorful sunrise and the trees which a few minutes before were in obscure light are now brightly illuminated; 6:02, the light male starts singing from his perch in the top of the lime tree; 6:04, the light male is uttering his complete song six or seven times each minute; 6:08, the dark male appears in the Pitanga bush, utters several chirps, and then bursts into full song, apparently in answer to his co-mate; 6:25, the female has left her nest and worked her way down to the lower branches of the nesting tree. In response to her feeble chirps both males abruptly stopped their singing and came to her. They flew in small circles about the female and one of the males flew directly at her, causing her to seek another perch. When the males again ventured too close she warded them off by thrusting with her beak but never actually striking them; 6:38, the female flew to the ground and mounted a tall seed-laden grass stem which bent and swayed back and forth under her weight. She worked her way to the end of the stem to feed on the seeds. The two males, one on either side about five to ten feet away from the female, also fed on seeds. During 12 minutes the trio fed in this manner, but now and then the males in turn would fly in a circle above the female and then return to another grass stem; 6:50, the female returned to a low branch of the orange tree to preen her feathers methodically. The males followed her and again went through their circling maneuvers, but

always keeping a considerable distance from the female and from each other; 7:02, the female flew directly to her nest to continue her task of incubating the eggs. The two males left the vicinity of the nesting tree together and flew to the lower area of the clearing, probably to continue their feeding. The dark male returned at 10:00, the light male at 10:30, and both sang intermittently during the remainder of the morning; at times one or both would be absent from the vicinity. The female left the nest at noon after three hours of continuous incubation. During these long periods at the nest the female frequently shifted her position, and with each change she apparently adjusted her body to the eggs. Sometimes the periods at and away from the nest were of shorter duration. Arbib (MS) who watched an incubating bird at Gatun during a clear, warm day found ". . . the female during a 144-minute period left the nest eight times. Her absence varied from 4 to 20 minutes and her spells at incubation 1 to 25 minutes. During this time she spent 84 minutes on the nest and 60 minutes away from it." The female at my nest returned to incubate at 2:15 p. m. and remained on the nest until 4:30. The males had not been seen since noon but appeared soon after the female alighted on the lower branch of the nesting tree. For 18 minutes the males circled about the female, at times alighting on the branch near her. Finally all three flew away and disappeared into the jungle. No acts of copulation, other than those previously noted, were observed. At 5:45 the female returned to the nest after an absence of an hour and 15 minutes. When settled on the nest her tail pointed upward at a sharp angle and her head was pulled down low in the nest with her eyes level with the brim of the nest. When I left the nest at 5:50 p. m. the female was on the nest and both males were singing. With minor variations the behavior of the three birds was similar during the following two days.

On July 16, the eggs were intact at 6 o'clock in the afternoon, but both eggs had hatched when I visited the nest at seven the next morning. Judging from the moist down, the young had just emerged, establishing the incubation of this clutch of the Hicks' Seedeater as 12 days. The egg shells had been removed. Skutch (1945) also found the incubation periods of two sets of eggs of this seedeater to be 12 days.

EARLY NEST LIFE OF THE YOUNG

I never saw the males visit the nest during the incubation period, but an hour after I found the two young they were being fed by the light male as well as by the female. The female at frequent intervals brooded the young for 15 to 20 minutes at a time. At one time when the female was brooding, the light male flew to the nest and perched

on its edge. The female stood back on the opposite side of the nest as the male fed the young a regurgitated mass of food delivered by quick thrusts into the widely-opened mouths. The male remained 2.5 minutes and as soon as he left the female slipped into the nest to continue brooding. I did not see the dark male this first day, but on the following day both males were in evidence; they took turns in feeding the young and both did considerable singing.

Most of the food consisted of a viscid milky material probably derived from the seeds on which they were seen to feed, but a number of insect larvae were included in the diet. For example, at 4:30 of the afternoon of July 18 when the young were two days old the female was seen exploring the leaves of some pepper plants infested with small green larvae. She was seen to mince one of the larvae in her beak and then fly to the nest to feed it piecemeal to the two young. On July 19 the light male appeared at the nest with a brownish green larva more than an inch in length. He extended his beak with the wriggling larva towards the female. She took hold of the distant end and minced it thoroughly in her beak while the male held the other end and likewise crushed his part. Then both birds pulled until the larva parted. The female minced her half of the larva again before delivering it to one of the young: The male presented his part to the female and she in turn fed it to the other young. I saw no insects or insect larvae fed to these young after the fourth day, although the nest was under daily observation. At nests studied during October, 1927, insects constituted a more important part of the food of the young during the entire nest life.

On July 24, when the nestlings were six days old, continuous observations were made of the activities of the birds about the nest from 5 o'clock in the morning, when it was still dark, until 7:30 in the evening, more than an hour after sunset. The activities of the seedeaters, correlated with the time of day and the presence of other birds and mammals, proved most interesting but space does not permit more than a brief summary of the notes. At this stage of development the young were not brooded, and no adults were present when the observations began. It was not until 6:09 a. m. that the first song of one of the adult males was heard. Three minutes later both of the males were heard singing in their respective singing trees. Soon thereafter the female appeared at the nest for the first time, not to deliver food but to remove a large brownish faecal sac. The female delivered the first food to the young at 6:18 and then made two subsequent feedings before the light male brought food at 6:35 and the dark male at 6:47. The last food for the day was delivered by the female at 6:13 p. m.

During the approximately 12 hours of continuous observation the young were fed 56 times—29 times by the female, 17 times by the light male, and only 10 times by the dark male. The males sang frequently during the course of the day and sometimes one or the other and on two occasions both males accompanied the female when she fed the young without delivering food themselves. The young were fed on an average of once every 13 minutes during the 12 hours, but feeding was more frequent during the early morning and late afternoon hours of the day. The actual feeding required just a few seconds but the adults would linger at the nest for 10 to 20 seconds after the food was delivered. The longer periods included waiting to secure a faecal sac, which sometimes involved a gentle prodding of the young by the adults. At this stage the faecal sacs were carried away, but during the first days of nest life the faeces were eaten by the adults, a usual procedure for the birds of this group. The young at this age were not brooded at any time during the day of observations. Furthermore, several visits with a flashlight to the nest during the preceding and following nights never revealed the adults in the nesting tree. I never was able to determine where the adults spent the night.

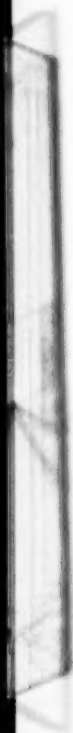
On July 22, I observed peculiar behavior on the part of the female. At 8:24 a. m., after feeding the young she carefully scrutinized the nest and the young, poking her bill down into the nest and among the young for three minutes. She then spent 19 minutes carefully going over the entire exterior of the nest, thrusting her beak into the fibers as if making repairs to the structure. During this time the young were fed by the dark male, who seemed to pay no attention to the female and what she was doing. The next day the procedure was repeated and, stationed at a nearer observation post, I carefully followed her movements with my binoculars. The bird was not manipulating nesting fibers but was methodically ridding the nest of ants. Ants are very numerous in the tropics and I have seen nests which were overrun by the pests and the young finally killed. The female Hicks' Seedeater was seen to grasp the ants in her beak, crush them, turn her head, and drop them. Some of the ants may have been eaten, but I did not see the bird applying the juices of the ants to her plumage. However, Skutch (1948) includes this seedeater among the birds he has observed "anting." An examination of the branches of the orange tree revealed a considerable number of ants.

NESTING RECORDS AND THE NEST

In the Canal Zone there are nesting records of Hicks' Seedeater from the last week of May to October. At Barro Colorado Island in 1927



(Top) FEMALE HICKS' SEEDEATER INCUBATING TWO EGGS IN NEST ON WEED STALK. BARRO COLORADO ISLAND, SEPTEMBER 21, 1927. (Bottom) NEST AND EGGS OF HICKS' SEEDEATER ON BARRO COLORADO ISLAND, OCTOBER 27, 1927.



the nesting season seemed to be at its height in September, when I found seven occupied nests in the relatively small area of the clearing. Doubtless there were others which escaped my notice. Two of these nests still contained young during the second week of October, and another nest with two eggs was found as late as October 22, 1927. I know of no nesting records in the Canal Zone for the months from November to April.

TABLE I
MEASUREMENTS IN INCHES OF THREE NESTS FOUND ON BARRO COLORADO ISLAND

No.	Date	Location	Height from ground	Outside diameter	Out- side depth	Inside depth	Inside diam- eter
1.	Sept. 22, 1927	small tree	5 ft., 8 in.	3.25 x 4.35	2.25	2.0	2 x 2.25
3.	June 30, 1949	croton bush	3 ft., 6 in.	3.0 x 3.5	2.50	1.75	1.85
3.	July 1, 1949	lime tree	11 ft., 8 in.	3.0 x 3.75	2.55	2.25	1.62

In Costa Rica, according to Alexander Skutch (letter), "the Hicks' Seedeater nests later than most small birds beginning in May in an unusually wet year, but not until June or July when the dry season has been long and severe. It waits until the grasses, which spring up with the return of the rain, have set seeds with which to feed the nestlings. It rarely nests later than August although there may be a nest or two in a sort of subsidiary breeding season at the beginning of the dry season in December and January." (See also Skutch, 1950.)

The nests in the Canal Zone have been located in a diversity of situations, ranging from those built in weed stalks and grasses to others located in shrubs and in trees at elevations well above the ground. An extreme case being a nest built 26 feet from the ground near the top of an orange tree. Most nests on Barro Colorado Island were located in small trees or shrubs.

The nests of Hicks' Seedeaters are usually made of plant fibers, fine grass stems, and rootlets, firmly interwoven to produce a neat substantial structure (Plate 11). Some of the nests are insecurely attached to branches and stems of the plants, shrubs, or trees in which they are built. This sometimes results in a nest tipping to one side when the frail attachments become loosed or broken from one cause or another. One nest under observation during September, 1927, tilted over after the incubation of the eggs was well-advanced, causing the adults to desert it. Mr. Robert Arbib who studied a nest at Gatun during August, 1934, recorded a similar experience in his unpublished notes on this species.

Nest Number 1 was made up entirely of long slender plant fibers of uniform size. It was insecurely fastened to the main and three small

lateral branches of a small tree. Some of the fibers were wound about several of the leaf stems. Nest Number 2 was made up of light brown fibers interwoven with dark-colored rootlets. The fibers on the outside of the nest were similar to those that made up the lining. Nest Number 3 was near the tip of an upper branch of a lime tree and well supported and attached to five small branches. The entire nest was made up of reddish brown fibers some of which exceeded two feet in length. These fibers were identified by Dr. I. W. Bailey of the Harvard Institute for Research in General Plant Morphology as rhizomorphs from *Marasmius samentosus* Berk. Many of these fibers protruded from the main part of the nest, presenting a ragged appearance. The interior of the nest was smooth, and neatly and compactly woven. Two of several other nests examined contained coal black fibers that closely resembled horse hair, but which also proved to be rhizomorphs of a fungus.

THE EGGS

The following description is based on two fresh eggs examined July 4, 1949. All of the color determinations are based on Ridgway (1912). The ground color was Pearl Gray, marked with spots and blotches of Pale Mouse Gray and Quaker Drab. Over these paler markings were blotches and marks of Benzo Brown and a few linear marks of Dark Mouse Gray, some of them approaching black in color. The latter were distributed chiefly on the circumference nearer the larger end of the egg. The smaller ends had a few small spots of Pale Mouse Gray.

In the 15 nests of the Hicks' Seedeater I have examined, there were but 2 eggs or 2 young. Two is the usual number, but rarely three may comprise a complete set. Skutch informs me that he has found as many as 70 nests at San Isidro, Costa Rica, and of these only one contained 3 eggs; all others had two eggs or two young. David E. Harrower (1936) reports four nests of this seedeater at Gatun, Canal Zone, each containing two eggs. Mr. Eugene Eisenmann has found

TABLE 2
MEASUREMENTS OF THREE SETS OF EGGS OF HICKS' SEEDEATER

Date	Weight in grams	Long diameter in mm.	Short diameter in mm.
September 22, 1927	1.76	16.1	14.4
	1.65	17.5	13.4
September 18, 1927	1.64	17.6	13.2
	1.75	18.6	14.5
July 4, 1949	1.80	18.5	13.6
	2.00	18.7	13.8
Average	1.76	18.1	13.8

several nests in which there were three eggs or three young: at Juan Franco, District of Panama City, a nest of three young on June 17, 1948; in 1949 one nest with three young, and two nests with two eggs each; and on June 23, 1951, two nests on Barro Colorado, of which one contained three and the other one had two young.

The average measurements of 8 eggs from Costa Rica reported by Skutch (1945) are 17.3 by 13.1 mm., and the average measurements of 23 eggs made more recently by Skutch are 17.4 by 13.0 mm. Measurements made by Harrower (1936) at Gatun, Canal Zone, are 16.5 to 17.5 by 12.7 to 13.3 mm.

DEVELOPMENT OF THE YOUNG

For comparative weights and dimensions see Table 3.

First day.—July 17, 1949. The down a few hours after hatching is Dark Neutral Gray blending to Light Neutral Gray at tips. Tufts of down present on crown, nape, humeral, crural, and spinal regions, also two very small ventro-lateral tufts. Down varies in length: on crown 8 mm.; spinal region 6 mm.; and ventro-lateral tufts only 3 mm. Naked parts of body vary from Buff-pink to Light Ochraceous-buff; tarsus and toes, Warm Buff; nails, Ivory Yellow; lining of mouth, Peach Red; and exposed edges of gape, Barium Yellow. Young similar to this on second day except that feather papillae of remiges appear faintly along edge of manus.

Fourth day.—July 20, 1949. Because of great growth of young, down tracts appear thinner and more diffuse. Color of down has faded to Mouse Gray. Dorsal apteria have changed to Brownish Drab, and ventral naked parts to Light Grayish Vinaceous. Tarsus and toes are Vinaceous-buff, and exposed parts of gape have changed to Naphthalene Yellow. Eyelids are separated by mere slit 3 mm. in length, but eyes are not as yet held open. Some tracts of juvenal plumage are now outlined by rapidly growing papillae; remiges are 3 to 4 mm., wing coverts 2 mm., but rectrices only 0.2 mm. in length. Papillae of feathers of ventral and spinal tracts are barely visible.

Sixth day.—July 22, 1949. All feather tracts are well defined, but feather papillae of the capital tract barely protrude through integument.

Eighth day.—July 24, 1949. At this time the young are alert and active and exhibit fear when approached, sit erect resting on their tarsi, and partially support themselves by their wings. Eyes are held wide open; iris is dark brown. Papillae of juvenal plumage, especially on wings, are most conspicuous feature of contour of young. Most down, excepting that of crown and spinal region, has been frayed or worn away. Process of unsheathing of papillae has progressed rapidly: those of secondaries, 6 mm.; and those of greater wing-coverts are freed for 10 to 12 mm.

Tenth day.—July 26, 1949. On the morning of July 26, the young were seen perched high on the edge of the nest where they were being fed by the female and the two males. At ten days the unsheathing of the papillae of the juvenal plumage has progressed so extensively that viewed from above the bird appears completely covered with feathers, excepting the middle of the crown where the feathers still retain their sheaths. Only minor tufts of down remain on the crown; elsewhere the down has been lost. Feathers of side of head, nape, back, greater and lesser wing coverts are Slate-olive. Primaries and secondaries are Deep Mouse Gray, coverts of secondaries

edged with Grayish Olive. Feathers of belly are Cream-buff which shades to Ecru-olive on flanks and to Olive on breast. Chin and throat are lighter, with distinct tinge of yellow. Lining of wings is Deep Colonial Buff. Maxilla is Dusky Drab; mandible, Hair Brown; edges of gape, Baryta Yellow; tarsus and toes, Light Brownish Drab; and claws, Light Drab.

TABLE 3
WEIGHTS IN GRAMS AND DIMENSIONS IN MILLIMETERS OF YOUNG
AND ADULT HICKS' SEED-EATERS

Date	Young—1949							Adults—1927	
	July 17	18	20	22	24	26	27	Male Aug. 28	Female 28
Age in days	0	1	3	5	7	9	10		
Weight	1.35	1.95	4.19	6.05	7.35	8.20	7.40	9.70	9.45
Length	28.0	32.5	44.0	58.5	62.0	67.0	71.0	112.0	110.0
Culmen	3.5	4.9	5.0	6.1	7.0	7.2	7.5	9.5	9.9
Bill depth		4.5	5.1	5.9	6.2	6.3	6.3	7.2	7.0
Bill width		3.6	4.0	5.0	5.1	5.1	5.2		
Eye to tip of bill	6.0	6.7	7.8	8.1	8.9	9.1	9.2	11.5	11.5
Nostril to tip of bill	2.1	2.2	2.9	3.1	4.0	4.2	4.3	7.0	7.5
Extent	22.0	31.0	49.6	89.8	116.	138.	142.	173.	168.
Wing	9.0	9.2	12.0	13.0	15.0	17.0	17.5	52.0	51.0
Tarsus	7.6	8.0	10.1	14.3	14.9	15.6	15.8	17.5	17.3
Toe-toe	8.7	9.4	12.0	13.5	20.5	25.0	26.0		
First toe	4.9	5.1	6.9	9.8	10.5	11.0	11.2	12.0	12.0
First toe nail	1.8	1.9	2.2	2.9	3.0	4.9	5.8	6.2	6.3
Third toe	4.7	5.0	8.5	11.0	13.1	14.0	14.1	15.0	15.0
Third toe nail	1.8	1.9	2.2	2.8	3.5	4.9	5.5	6.0	5.8
Middle tail feather	—	—	0.2	1.2	3.1	5.0	8.0	42.0	42.0
Unsheathing tail feather	—	—	—	—	0.5	1.6	5.0	—	—
Fifth primary	—	—	3.0	14.9	22.5	28.0	32.0	40.0	40.0
Unsheathing fifth primary	—	—	—	—	3.0	16.0	22.0	—	—

Twelfth day.—July 28, 1949. The young left the nest on the tenth day and remained perched near the nest. On the twelfth day the young were capable of short flights and by easy stages gradually left the vicinity of the nesting tree. Under normal conditions in which the young were not disturbed by my frequent visits to the nest they remained in the nest 12 days and in the case of one nest in 1927 they did not leave until the thirteenth day.

In one instance a nest was destroyed by some predator, and the same pair of birds constructed a second nest. I was unable to determine whether or not two broods were raised during any one nesting season by a single pair of birds. During September and October, 1927, I saw several family groups feeding on the seeds of the tall grasses of the clearing. The young secured their own food. The family groups were maintained for a considerable length of time, and I saw no tendency on the part of the adults to desert the young for another attempt at nesting at that period of the breeding season.

PARASITES

On August 30, 1926, Dr. James Zetek noticed tiny nodules on the necks of two nestlings of a nest he found in a small orange tree of the

clearing on Barro Colorado Island. On September 3 one of the birds was dead, and the other with many tumor-like masses on its neck was in such bad condition that it died soon after it was taken from the nest for detailed examination. It was heavily infested; Dr. Zetek counted a total of 47 larvae which emerged from the one bird. The larvae were allowed to pupate and a number of the adult parasites were reared. The specimens were identified by Dr. Charles T. Greene, Curator of Diptera of the U. S. National Museum, Washington, D. C., as the dipterous parasite, *Philornis pici* Macquart. Mr. Eugene Eisenmann reports that on July 3, 1950, he found in a nest on Barro Colorado Island a young Hicks' Seedeater which was parasitized by a fly, presumably of the species mentioned above. Mr. Eisenmann states there was a large perforated lump on the cheek and another at the shoulder of the fledgling where the feathers were not well grown. As is true in general of many birds in the tropics, especially those building open nests on or near the ground, the Hicks' Seedeater is subject to predators as well as parasites during the nesting season. Less than half of about 50 nests of various species I have observed on Barro Colorado Island have been successful in rearing their young to maturity.

SUMMARY

1. Hicks' Seedeater is permanently established as a nesting species on Barro Colorado Island, Canal Zone.
2. The female built the nest, in those instances in which nest construction was observed.
3. Two males copulated with a single female, establishing a definite case of polyandry for Hicks' Seedeater.
4. The incubation period of Hicks' Seedeater was 12 days. Only the female incubated the eggs.
5. Both males assisted the female in feeding the young.
6. A few insect larvae were fed to the young during the first few days, but the greater part of the food, seen delivered in 1949, was a white viscid substance, probably predigested seeds, that was fed by regurgitation. A larger percentage of insects was fed to the young of nests studied in 1927.
7. The female was observed collecting and killing ants which had infested the nest.
8. Nests of Hicks' Seedeater are located in a diversity of situations that range from among grasses and weeds to well above the ground in shrubs and trees.
9. Nests of Hicks' Seedeater have been found in the Canal Zone

from May to October inclusive. No records were obtained from November to April.

10. The usual set of eggs is two. A few cases are cited where there were three eggs or young in one nest.

11. Descriptions of various ages of the young and a table of weights and measurements of the young and adults are given.

12. A dipterous parasite, *Philornis pici*, was the cause of death of two young.

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Bowdoin College, Brunswick, Maine, January 7, 1952.

THE HAWAIIAN COOT

BY CHARLES W. SCHWARTZ AND ELIZABETH REEDER SCHWARTZ

Distribution and Abundance.—The Hawaiian Coot, *Fulica americana alai* Peale or "alae keokeo," is one of the few native birds of Hawaii that has maintained itself in sufficient numbers to be fairly common on most islands at the present time. In the past, it was abundant on all the major islands, particularly Oahu, Maui, Molokai, and Kauai, which possessed coastal brackish and fresh-water ponds or marshes, reservoirs, or large streams (Wilson and Evans, 1890-1899; and others). In 1891 Munro (1944) saw from 500 to 600 coots on a "lagoon" near Lihue, Kauai. Perkins (1903) reported that the coots gathered in flocks of considerable size and from 50 to 100 occurred together on a "fair-sized pond."

The Hawaiian Coot lives from sea level to 500 feet elevation in both arid and semi-humid regions wherever there is some open fresh or brackish water bordered by emergent aquatic vegetation or heavy stands of grass. It is non-migratory and has no obvious seasonal

movements. It still occurs on all the major islands except Lanai and Kahoolawe which lack suitable habitat.

On Hawaii, the Hawaiian Coot is rare, occurring only occasionally on some of the few reservoirs or ponds, and in the lower part of Waipio Stream and flooded taro patches. On Maui, the only area with any concentration was the Kanaha Pond near Kahului where we saw 300 coots on August 12, 1946. On Molokai, coots inhabit the few coastal ponds and 250, recorded on one pond on September 5, 1946, represented the greatest number we observed there. The population is very scattered but abundant on Kauai and birds were found on practically all the lowland portions of streams, reservoirs, and irrigation ditches. Fifty birds represented the most observed at any one time on this island and this was on the Grove Farm Reservoir on October 24, 1946. On Oahu, the Hawaiian Coot is common. On April 6, 1947, we counted 500 coots and estimated an additional 500 in one flock on the 300-acre Kaelepu Pond. This was the maximum concentration we saw anywhere. On this island coots were observed on nearly all the reservoirs, coastal marshy areas, and "fish ponds." Fisher (1951) did not observe this species on Niihau in 1947 and believed it only occurred there periodically because of the temporary nature of the aquatic areas on that island.

Breeding.—We do not know the span of the coot's breeding season, but we observed or had reliable reports of nests and young in April, May, June, August, and September. Henshaw (1902) reported nesting of the Hawaiian Coot as early as February and half-grown young were observed by him on April 30. He also saw a nest with two eggs on August 17. On July 20, two nests were found on Niihau by Palmer (Rothschild, 1893–1900); these contained three and five eggs, respectively.

On April 6, 1947, during a brief visit to Kaelepu Pond, Oahu, we observed eight coot nests in a very limited examination of part of the marshy cover of bulrush (*Scirpus validus*), beach akulikuli (*Batis maritima*), and the submerged grass (*Paspalum vaginatum*) comprising the shoreline. Two of the nests were examined. One, containing six eggs, was located in a sparse clump of bulrushes growing in water 1.5 feet deep. The nest was about two feet by 1.5 feet in diameter and consisted of a partially floating platform of bulrushes; the basal portion was made of rush stems about one-half inch in diameter while the upper portion and lining consisted of somewhat thinner stems. The nest bowl, which was clean and without droppings, measured six inches in diameter by two inches deep, and was about three inches above the water's surface. The eggs were not covered with vegetation.

They were light buffy tan speckled with tiny flecks of dark brown or tan and measured as follows: 49 x 35 mm.; 46 x 35 mm.; 48 x 36 mm.; 46 x 34 mm.; 46 x 34 mm.; and 49 x 35 mm. The basal platform of another nest, located in a stand of partially submerged grass, was made chiefly of grass stems and blades strengthened with bulrush stems. Grass formed a scant lining. The nest was approximately 1.5 feet in diameter; its bowl was two inches deep and three inches above the water's surface. A small open zone of water surrounded this nest. It is likely that this clearing represented the area from which grass blades and stems were gathered to build the nest. There was one egg in the nest and it measured 50 x 32 mm.

On May 14, 1947, we again visited the Kaelepulu Pond and during an examination of the outer margin of the marsh vegetation along approximately one-half of the shore, counted 48 coot nests. Of these, 3 were in the process of construction, 30 were vacant and appeared to have fulfilled their function, and 15 had clutches. More nests probably would have been found had we inspected the denser plant growth bordering the pond. Most of the nests we observed were located in the open water along the margin of the bulrush stand, and were often within 10 or 15 yards of each other. However, some were within the thinner portion of the bulrush bordering the pond. The nests were similar in size and construction to the two described above but varied slightly in the amounts and kinds of materials used. Certain nests were built of beach akulikuli alone or in combination with bulrush. (Perkins, *op. cit.*, reported nests to also consist of branches and twigs of algaroba, *Prosopis chilensis*, and sometimes the leaves of *Pandanus* sp.) In some nests a definite landing stage was apparent from which the occupant entered and left the nest. The clutch size in the 15 nests which contained eggs on this date varied from 4 to 10 with an average of 6.1. However, we did not ascertain whether all of these represented complete clutches. At the time of this visit we counted 400 coots in the open water of the pond and doubtless many birds were not observed because they were engaged in nesting activities. Sample counts from the flock showed a 6 : 1 ratio of adults to recognizable young. Some of the young were capable of flight and later easily eluded us in this manner when we pursued them in our kayak.

In June, 1946, coots were reported to be commonly nesting on Molokai, and their young were numerous there during August. On this island on September 5, 1946, we observed three coot nests in the periphery of a four-acre shallow coastal pond. The three nests were occupied by incubating adults. In the open water 250 coots were assembled in a rather compact flock.



(Top) RESERVOIR OF THE TYPE OCCUPIED BY HAWAIIAN COOTS ON KAUAI ISLAND, T. H. FEBRUARY 7, 1947. ALL PHOTOGRAPHS BY C. W. SCHWARTZ. (Bottom) EDGE OF KAELEPULU POND, OAHU, SHOWING HABITAT USED BY HAWAIIAN COOTS FOR NESTING. CIRCLE SHOWS POSITION OF ONE NEST. APRIL 6, 1947.



HAWAIIAN COOT ENTERING ITS NEST BY WAY OF A "LANDING STAGE". KAELEPULU POND, MAY 14, 1947.



INCUBATING HAWAIIAN COOT. KAELEPULU POND, OAHU, MAY 14, 1947.



NEST OF HAWAIIAN COOT WITH FULL CLUTCH OF EGGS. NOTE THE AREA TO THE LEFT, WHICH IS FREE OF BEACH AKULIKULI AND SERVES AS A "LANDING STAGE" FOR ENTERING AND LEAVING THE NEST. KAELEPULU POND, OAHU, MAY 14, 1947.

Measurements.—An adult male Hawaiian Coot was found dead and floating on the Koloa Reservoir, Kauai, on March 8, 1947. It measured as follows: total length, 385 mm.; culmen, 45; extent of wing, 650; closed wing, 185; tail, 35; and longest toe, 80.

Lice.—A heavy infestation of lice occurred on this specimen. The following species were identified by Dr. E. W. Stafford of the U. S. Fish and Wildlife Service: *Pseudomenopon pacificum* (K.), *Incidifrons pertusus* (Nitz.), *Fulicoffula lurida* (Nitz.), and *Raillicola advena* (K.).

Food.—An examination of the crop contents disclosed that this bird had fed upon guava seeds, *Psidium Guajava*, and fibrous plant stems. On the Koloa Reservoir, other coots were observed feeding beneath guava trees growing next to the water and foraging upon the ripening seed heads of grass bordering the reservoir.

Future.—At present the Hawaiian Coot appears sufficiently numerous to insure its survival; however, the current reclamation program of the large marsh areas on Oahu will certainly disperse the species to less desirable habitats on that island and in all probability, drastically alter its status there. Barring some unforeseen adverse factor, coot numbers will doubtless remain relatively stable on other islands as long as the present land-use pattern continues.

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Conservation Commission, Jefferson City, Missouri, May 1, 1952

SUPPLEMENTARY DATA ON THE TROPICAL AVIFAUNA
OF THE ARID UPPER MAGDALENA VALLEY
OF COLOMBIA

BY ALDEN H. MILLER

IN 1947 a report (Miller, Auk, 64: 351-381) was made on the avifauna of the arid tropical area in the upper Magdalena Valley at Villavieja, Huila, Colombia. One hundred and thirty species were recorded. Although it was known that more species occurred in the area, the list at that time seemed reasonably complete. We had no prospect of further intensive field work in the Valley, but in 1949 the Associates in Tropical Biogeography of the University of California began sponsoring an investigation of the breeding cycles of vertebrates in this near-equatorial area and thus opportunity came for me to return to the field there from January 26 to March 7, 1949. Incidental to the study of cycles, considerable faunistic information was obtained which is reported herewith to supplement the earlier account. Twenty-five additional forms are recorded from the valley floor, all but six from the vicinity of Villavieja, and for a few species previously mentioned new information on behavior is given. A review of the fauna of the valley floor from Giradot to central Huila based on recent literature also is undertaken.

The expedition of 1949 permitted visiting a wider variety of places in the valley than previously, enabled me to see more of the biotic and physiographic barriers bounding the basin, and allowed exploration of some tracts of streamside forest less disturbed by human activity than those examined in 1945. The main base of operations was five kilometers north of Villavieja, a camp at the edge of the fossiliferous badlands designated Cerbatana. At this point was a tributary stream course of the Magdalena River, and about three kilometers to the west the main river channel with some mature forest and woods 50 to 100 feet high could be reached. It was in the river bottom particularly that additional species of birds were found. Some localities in the eastern and western foothills were visited briefly. No records from areas higher than 2600 feet are included; at this elevation the thorn scrub of the mesas gives way to less xeric plant growth, and a fauna not considered characteristic of the arid lower tropical floor of the basin begins to come in.

In addition to my indebtedness to the Associates in Tropical Biogeography for financial backing, I am much obliged to the Instituto de Ciencias Naturales de la Universidad Nacional de Colombia in Bogotá,

and especially to Dr. Armando Dugand and Jose I. Borrero of that institute, for assistance in arranging and carrying out the expedition and to the Servicio Geológico Nacional through Dr. Roberto Sarmiento and his staff, particularly Diego Henao and Alberto Sarmiento, for sharing camp and transportation facilities and for many other aids. Subsequent expeditions to Colombia in 1950 by my colleagues, Oliver P. Pearson, Robert C. Stebbins, and John R. Hendrickson also contributed some data on the composition of the avifauna, although their principal activity was directed to the cyclic studies and to the collecting of mammals, reptiles, and amphibians.

In the following list the species marked with an asterisk are additions to the list presented earlier. Observations are from the vicinity of Camp Cerbatana and in 1949 unless otherwise noted.

**Phalacrocorax olivaceus* (Humboldt).—Seen in two's flying up the Magdalena River on February 14.

**Casmerodius albus* (Linnaeus).—Seen at Neiva, Huila, on January 30, in flooded fields and also at Garzon, Huila, on February 17.

**Sarcoramphus papa* (Linnaeus).—This species appeared about the camp on October 25 and 27, 1950, to feed on animal carcasses with other vultures. One, apparently an immature lacking the dorsal white areas of the plumage, was taken on November 3 and saved as a skeleton; iris yellow, and cere red, orange, and yellow.

**Accipiter bicolor bicolor* (Vieillot).—Twice encountered in 1949, this species has been reported previously from the valley at Purificación (Chapman, Bull. Amer. Mus. Nat. Hist., 36: 247, 1917). On February 2 in a tall grove of streamside woods a young buff-breasted hawk was found. The tail was only two-thirds grown. The adults in attendance were taken. The female had a foot of a Bob-white in its stomach. The male was heard to give a soft clear whistle. The ventral plumage of the male is light blue-gray, but the female is darker gray and has intermixed buffy feathers on the belly from a previous immature plumage. Specimens: adult ♂, testis 8 mm., weight 250 gm.; adult ♀, 425 gm., feet, face and iris yellow; adult ♂, February 6, testis 6 mm., weight 190 gm.

**Buteo brachyurus* Vieillot.—One was taken on February 25 in an area of scattered scrub on a mesa top. It was a female in completely black plumage phase; cere and feet yellow; iris brown; largest ovum 2 mm.; weight 425 gm.

Geranospiza caerulescens caerulescens (Vieillot).—An immature female (350 gm.) taken on March 6, eight kilometers north of Villavieja had the remains of nestling Paroquets (*Forpus*) in the stomach. The extremely long legs of this Crane-hawk must enable it to reach into the nest holes of Paroquets, which commonly are situated in fence posts. The young Paroquets this hawk had taken had such slightly developed feathers as to indicate that they were too young to have ventured from the bottom of the nest cavity. Another hawk of this species taken on February 12 had a bird wing of undetermined species in the stomach. This hawk, an adult, had a yellow ovarian ovum 7 mm. in diameter; eyes dark red; feet orange; weight 475 gm.

Oriolus columbiana columbiana Hellmayr.—A female taken on February 25 had an edematous brood patch and ovarian ova up to five mm. in diameter. There was no coiling of the trachea in this adult, which suggests that coiling is confined to the male. On February 2 a half-grown young was taken and on February 14 a male with testis

12 mm. long, which specimens further indicate the time of the breeding season. Weights were: ♂, 600 gm.; ♀, 500 gm.; ju. ♂, 225 gm.

A specimen of *Ortalis guttata caquetae* from Finca Caño Rico, Boyacá, on the east side of the Andes, taken June 6, 1946, by R. A. Stirton reinforces my opinion that *O. guttata* and *O. columbiana* are not conspecific. Although these types are allopatric, the strikingly different color pattern of the head and neck and the lanceolate and wedge-shaped feathers of these areas in *columbiana*, even in the juvenal bird, suggest that the two kinds may be so different as to be incapable of interbreeding in nature. Until there is better evidence bearing on this matter, I prefer to treat them as full species.

**Charadrius collaris* Vieillot.—One was taken by Diego Henao in a wet sandy wash near some water in a tributary of the Magdalena River, eight kilometers north of Villavieja on March 6; testis, 4 mm.; weight 25.5 gm.

**Columba cayennensis occidentalis* Sztolcman.—This pigeon is common in the arid thorn scrub and in the broken woods in the river bottom, but it could not be reported earlier for lack of specimens. Skins taken in 1949 show that the birds are not of the race *pallidicrissa*, as it was suspected they might be, for they lack the clear white crissum of that form. Neither are they the richly rufous *C. c. tamboensis* of the Cauca Valley. They are separable from *C. c. cayennensis* of the east side of the Andes by the lack of a terminal tail band. Surprisingly, the resemblance throughout is with *occidentalis* of western Ecuador (specimens in Amer. Mus. Nat. Hist.) and I see no course but so to designate them. The species has been recorded at Giradot (de Schauensee, *Caldasia*, 5: 457, 1949). Both specimens taken were females: February 14, laying, weight 250 gm.; February 26, egg in duct, iris and feet red, bill black, 225 gm.

Leptotila verreauxi verreauxi (Bonaparte).—These doves were calling and evidently breeding in broken patches of woods about camp in February, and also in October, 1950. Hendrickson found a nest on October 22 containing two eggs. It was situated on a ledge of a six-foot cliff face partly screened by plant growth. The nest was a flat collection of sticks and grass stems. A female taken on February 13 shows two empty follicles in the ovary and one yellow ovarian ovum four mm. in diameter; iris, yellow; face, blue; weight 142.1 gm.

**Crotophaga ani* Linnaeus.—This species proved to be common in moist pasture land but not in the scrub where *Crotophaga sulcirostris* occurs chiefly. Partly for this reason it was not detected in 1945. Numerous specimens were taken in 1949 and 1950 for investigation of the breeding cycle. Reported previously at Melgar, Tolima (de Schauensee, *op. cit.*: 494).

Otus choliba crucigerus (Spix).—On February 12 a nest of this Screech Owl was found in the Laja Valley north of Villavieja. It was seven feet up in a 12-foot dead stub which was a foot in diameter. There was a rotted out limb that formed an access to the hollow interior. Two small young were 14 inches down from the entrance. When I first approached the area, an owl was seen perched among fairly open twigs of a small tree in mid-morning light. It distorted and lengthened its face in the concealing reaction but the ear tufts stood up only slightly. When it was shot, a second bird, the male, flushed from the nest stub, whether or not actually from the nest cavity I could not be sure. On January 31 a male was taken at night as it gave a low mellow trill with little acceleration at the end. This note, which resembled closely the trills of some of the western races of *Otus asio*, served to excite the bird when I whistled it. Evidently the note has the same aggressive or territorial significance as in the North American species. Specimens: ♂, January 31, testis 12 mm., iris

yellow, weight 142.4 gm.; ♂, February 12, testis 7 mm., 139.0 gm.; ♀, February 12, with brood patch, 163.2 gm.

**Asio stygius robustus* Kelso.—This owl has been considered typical of the subtropical and temperate zones, but on February 25 one was taken near our camp in the thorn scrub of a broken mesa border. In mid-morning my attention was attracted by the loud calling of a *Buteo magnirostris*. It was apparently excited by the owl which flew from the tree in which the hawk was calling. The owl moved 400 yards and was found sitting with ear tufts erect in a vine-tangled tree. It was a female; largest ovum 1 mm.; iris, yellow; weight, 675 gm.

**Phaethornis anthophilus anthophilus* (Bourcier).—On January 28 two of these hummingbirds were taken in a canyon bottom 14 kilometers west of Coyaima, 1500 feet, Tolima. These were seen at a red-flowering tree *Brownea arisa* in which the blossoms hung in large clusters. The hummers fed, while hovering, by probing directly up into the deep corollas, for which the long bill and neck of this hummer seem especially suited. Specimens: ♂, testis 2.5 mm., lower mandible, except tip, red, upper mandible black; juvenile, bill coloration same. This species has been reported south to Chicoral and Espinal.

Lepidopyga goudoti goudoti (Bourcier).—Herbert Mason, botanist of our party, found a nest of this hummingbird in a small croton plant at the base of a low sandstone cliff near camp. The nest was about two feet from the bare ground in an open crotch. The whitish lichens placed on the outside of the nest rendered it inconspicuous in the gray bush, but when the dark green adult sat on it she was so conspicuous as to be visible 60 yards away. On February 11 the nest contained two blackish half-grown young which the parent shaded from the mid-day sun. The young had yellow borders of the mouth and a small patch of rich brown down in the middle of the back. On October 24, 1950, a nest with two eggs was found in the same area.

**Momotus momota subrufescens* Slater.—Motmots were encountered occasionally in 1949 and 1950 in the heaviest woods of the river bottoms. On March 6 one was flushed from the entrance of a hole in flat sandy ground within the woods. The hole was about three inches in diameter and extended down at an angle for at least four feet. Specimens: sex?, January 31, iris red, weight 102.0 gm.; ♂, March 5, testis 5 mm., with brood patch, 94.8 gm.; ♂, March 6, testis 5 mm., with brood patch; ♂, October 29, testis 2 mm., 92 gm.

The three motmots saved as skins match closely the series of *subrufescens* from the Santa Marta district in the American Museum of Natural History. Also similar are the birds in that collection from Chicoral and Honda, Tolima, as Chapman originally (*op. cit.*: 271, 1917) indicated. Later Chapman (*Bull. Amer. Mus. Nat. Hist.*, 48: 27-59, 1923) assigned these birds from Tolima to *M. m. conexus*, along with two from the middle Magdalena Valley in the vicinity of Puerto Berrio, thus giving *conexus* a split range in Panamá and Colombia with *reconditus* occupying eastern Panamá and northwestern Colombia. On reexamining Chapman's material it appears to me that his birds of the middle Magdalena are very close to the paler variants of *reconditus* and might best be considered as intergrades of *reconditus* with *subrufescens* which show a color stage similar to *conexus* of Panamá. Such an interpretation avoids the incongruity of a split range for *conexus* and fits better with the *subrufescens*-like color of the birds of the upper Magdalena. We may then envision *subrufescens* extending south in the tropical zone from the Santa Marta district to the upper Magdalena Valley with birds of the mid-valley region showing some intergrading influence of the adjoining *reconditus* to the west. De Schauensee (*op. cit.*: 599) reports other specimens from the upper Magdalena to be the same as

birds of the Panama Canal Zone, a situation which inexplicably does not accord with the matching of my material and the birds from Honda and Chicoral with *sub-rufescens*.

**Veniliornis kirkii ceciliae* (Malherbe).—This species of small woodpecker was found in dense river bottom forest, working at middle heights in the 50-foot trees. Reported earlier from Chicoral (Chapman, *op. cit.*, 1917). Specimens: ♂, March 5, testis 9 mm., with brood patch, 35.0 gm.; sex?, March 5, 27.6 gm.

**Campylorhamphus trochilirostris venezuelensis* (Chapman).—Encountered once in tall river bottom forest eight kilometers north of Villavieja on March 6. The male taken had a testis 9 mm. long and a brood patch; weight 35.0 gm.; bill dull red. This woodhewer had recently fed on a large cicada, a type of food for which the exceptionally long, slender, curved bill of the species does not seem to be particularly adapted. Reported by de Schauensee (Caldasia, 5: 657, 1950) from Espinal and Gualanday.

**Certhiaxis cinnamomea fuscifrons* (Madarasz).—This spintail was found in an area of grass six feet high in the partly cleared river bottom on March 4. A group of them was stationed in low brushy trees in the grass by a small slough. They sat rather inactively and chattered. One, at least, postured deliberately with the head thrust straight up and the small yellow throat patch directed toward another bird. Specimens: adult ♂, testis 6 mm., iris dull ivory, weight 18.6 gm.; adult ♀, ovary inactive, iris dull ivory, 18.0 gm.; juvenal ♂, testis 1 mm., iris gray, 17.0 gm.

**Thamnophilus punctatus subcinereus* (Todd).—In brush at the edge of a canyon bottom wash 14 kilometers west of Coyaima, 1500 feet, Tolima, one of these ant-wrens was taken on January 28. This male is paler beneath than topotypical *sub-cinereus* from the Santa Marta district. This species has been reported south to Chicoral by Chapman (*op. cit.*, 1917).

**Camptostoma obsoletum caucae* Chapman.—Found once in river bottom forest eight kilometers north of Villavieja on March 6. This flycatcher has been reported previously from San Agustín and from the vicinity of Giradot and Chicoral (de Schauensee, *op. cit.*).

**Thryothorus leucotis leucotis* Lafresnaye.—Found on March 5 in the shaded dense vine tangles of a river bottom forest where at least six singing males were present in an area of about ten acres. Previously recorded from Chicoral by Chapman (*op. cit.*, 1917). Specimens: adult ♂, testis 5 mm., weight 24.2 gm.; adult ♂, testis 1.5 mm., 22.8 gm.

**Hylocichla minima minima* (Lafresnaye).—One of these winter visitant thrushes was taken on February 18 in a wooded ravine 20 kilometers southwest of Garzon, 2600 feet, Huila. It was a female showing immature skull; weight 33.1 gm.

Poliophtila plumbea anteocularis Hellmayr.—On February 27 I witnessed what appeared to be courtship or sex recognition display in this species. A male of a pair was shot, and soon the female began giving a whining note regularly. Another male appeared and postured before her repeatedly, taking a perch on the same level or below the female. He sang softly and steadily and took an erect position, bill straight up and with the back of the head with its black crown patch oriented toward the female whether she was above him or to the side. The female gave no sign of response, but the male continued to maneuver elaborately to keep the black patch directed toward her. The patch in the male of this gnatcatcher is large and has a sharply defined transverse posterior border far back on the nape. The function of this marking in sex recognition seems strongly suggested by the special display behavior.

**Vireo flavoviridis flavoviridis* (Cassin).—One of these migrant vireos was taken on March 4. It was a male with testis 2.2 mm. long and a heavy deposit of fat, conditions suggesting that it was in migration; weight 22.1 gm. The bird was singing, in what was probably about half-volume, in a dense-crowned tree near a banana grove. The species has been reported at Chicoral by Chapman.

**Dendroica aestiva amnicola* Batchelder.—Yellow Warblers, apparently of this race, were wintering in the valley. *D. a. aestiva* was taken in 1945. The gonads were small as in wintering birds and there was little or no fat. Specimens: ♂, February 1, weight 8.8 gm.; ♂, March 3, 8.8 gm.

**Basileuterus fulvicauda motacilla* Miller.—Warblers of this newly described race are now known from near Coyaima and Chicoral, Tolima, and from near Colombia, Huila. For comments on habitat, activity, and specimens see Miller (Proc. Biol. Soc. Wash., 65: 16, 1952).

**Psomocolax oryzivorus oryzivorus* (Gmelin).—On February 28 at Bodega, 2000 feet, between Colombia and Baraya, Huila, a loose flock of about 20 of these Rice Grackles was feeding in a dry rice field and in scattered mesquite at its borders. The bird taken had rice in the stomach; adult ♂, testis 4 mm., weight 200 gm.

**Agelaius icterocephalus icterocephalus* (Linnaeus).—Encountered in the tall grass borders of a slough near the main-river channel. No more than four were seen at one time. Two independent juveniles were taken from this group and one adult male was seen, the latter giving no sign of territorial establishment. This blackbird recently has been reported from Estación Saldaña (de Schauensee, Caldasia, 5: 999, 1951). Specimens: juvenal ♀, March 4, weight 27.0 gm.; juvenal ♂, March 5, 31.6 gm.

**Tanagra lanirostris crassirostris* (Scater).—Present in small numbers in broken woodland along tributary streams of the Magdalena. Reported at Chicoral by Chapman. Specimens: adult ♂, February 2, testis 8 mm., weight 15.3 gm.; adult ♀, February 9, ovum 1.5 mm., 15.1 gm.; immature ♂, February 14, female plumage, testis 2 mm., 16.9 gm.; adult ♂, March 3, testis 7 mm., 14.5 gm.

**Spermophila nigricollis nigricollis* (Vieillot).—One was taken on March 3 in bushes along the border of a wash. It was a male with 2 mm. testis; weight 10.2 gm. No others were seen in the area which had been visited frequently.

Volatinia jacarina splendens (Vieillot).—On February 14 I flushed a male from a nest situated one foot up in a grazed off clump of coarse grass. The top of the clump was two feet above ground and no other grass of any kind stood within a foot of the clump. The bird appeared to be a fully black male; I could not be certain that it had actually been settled on the nest, but it flushed when I was only three feet away. The nest was a thin, deep cup, and it contained two eggs.

Since these supplementary records increase the knowledge not only of the avifauna of the arid extreme of the valley floor at Villavieja but also indicate, with the previous report, the composition of the avifauna of the valley bottom generally from Giradot to Garzon below the 2600-foot level, it seems appropriate to list here the additional species reported in the literature. Only those reports giving specific record stations in the valley floor are included. Most of these are in Tolima, and particularly from Chicoral, Melgar, Cunday, Saldaña, and Purificación. This material is drawn from de Schauensee's excellent compilation of the distribution of the birds of Colombia (*op. cit.*) and the

additions entered therein by Dr. Dugand at the Instituto de Ciencias. Without this source this more complete faunal treatment would be impossible. The list, which brings the total avifauna to 192, is as follows:

<i>Nothocercus bonapartei discrepans</i>	<i>Arundinicola leucocephala</i>
<i>Pandion haliaetus carolinensis</i>	<i>Myiodynastes luteiventris luteiventris</i>
<i>Falco deiroleucus</i>	(non-resident)
<i>Himantopus himantopus mexicanus</i>	<i>Myiozetetes similis columbianus</i>
<i>Rynchops nigra cinerascens</i>	<i>Cnemotriccus fuscatus cabanisi</i>
<i>Piaya cayana mehleri</i>	<i>Capsiempis flaveola leucophrys</i>
<i>Piaya minuta gracilis</i>	<i>Phyllomyias griseiceps cristatus</i>
<i>Bubo virginianus elutus</i>	<i>Leptopogon amaurocephalus diversus</i>
<i>Campylopterus falcatus</i>	<i>Pipromorpha oleaginea parca</i> (also taken
<i>Florisuga mellivora</i>	by me 6 km. E Chaparral, 2700 feet)
<i>Chlorostilbon gibsoni gibsoni</i>	<i>Progne chalybea chalybea</i>
<i>Damophila julie julie</i>	<i>Progne tapera tapera</i>
<i>Amazilia cyanifrons cyanifrons</i>	<i>Vireo olivaceus</i> (non-resident)
<i>Amazilia saucerrottei warscewiczii</i>	<i>Dacnis lineata egregia</i>
<i>Chalybura buffonii buffonii</i>	<i>Dendroica fusca</i> (non-resident)
<i>Chrysomitris punctigula striatigularis</i>	<i>Wilsonia canadensis</i> (non-resident)
<i>Cercomacra nigricans nigricans</i>	<i>Ramphocelus dimidiatus molochinus</i>
<i>Myrmeciza longipes boucardi</i>	<i>Tachyphonus rufus</i>
<i>Manacus manacus flaveolus</i>	<i>Spermophila intermedia bogotensis</i>
	<i>Arremon aurantirostris erythrorhynchus</i>

In the earlier report it was possible to list 12 forms that appeared to be endemic to the upper Magdalena tropical district. All occurred on the floor of the valley even if they were not confined to it. To this list may now be added five more races:

- Chlorostilbon gibsoni gibsoni* (Fraser)
- Manacus manacus flaveolus* Cassin (de Schauensee; also taken by me 6 km. E Chaparral, 2700 feet)
- Basileuterus fulvicauda motacilla* Miller (1951, *op. cit.*)
- Ramphocelus dimidiatus molochinus* de Schauensee
- Tiaris bicolor huilae* Miller (1951, *op. cit.*)

The avifauna of the upper Magdalena basin contains a large group of forms which are essentially west-Andean and which for the most part reach their southeastern limits in this area compared with the small group with east-Andean affinities. To the previous list of 26 west-Andean forms the following 21 may now be added on the basis of improved information on ranges derived largely from de Schauensee's work. One form on the previous list, *Ramphocelus dimidiatus dimidiatus*, is now known to occur as an endemic race in the area but the species is west-Andean. The taxonomic entity involved in west-Andean relations is indicated in bold face type.

Columba cayennensis occidentalis
Piaya minuta gracilis
Bubo virginianus elutus
Asio stygius robustus
Nyctibius griseus panamensis
Damophila julie julie
Amazilia cyanifrons cyanifrons
Amazilia saucerrottei warszewiczi
Chrysomitris punctigula striatigularis
Veniliornis kirkii cecillii
Certhiaxix cinnamomea fuscifrons

Erator inquisitor albitorques
Myiozetetes similis columbianus
Capsiempis flaveola leucophrys
Camptostoma obsoletum caucae
Pipromorpha oleaginea parca
Thryothorus leucotis leucotis
Dacnis lineata egregia
Tanagra lanirostris crassirostris
Spermophila intermedia bogotensis
Arremon aurantirostris erythro-
rhynchus

To the list of nine eastern types, these three may now be added:

Otus choliba crucigerus
Podager nacunda minor
Turdus leucomelas albiventer

Some attention was given previously to the possibility that the low gap in the eastern Andes at Andalucia in southern Huila served as an avenue for dispersal of east-Andean forms into the upper Magdalena Valley. In 1949 I had the opportunity to travel through this pass, the elevation of which we checked as 7500 feet, and on through to Florencia and the lowlands to the east in Caquetá. Two factors now make me think this is an unlikely route for crossing of the east-Andean elements. First, the heavy cloud forest of the pass area and the tropical forest below are ecologically unsuitable for the forms in the Magdalena Valley under consideration and constitute therefore a vast barrier regardless of elevation or precise zonal classification of the pass, which I would judge approaches temperate conditions. Second, the lowland fauna of Caquetá is of Amazonian forest type, not that of the Llanos to the north, to which latter the forms of the Magdalena basin are most related. The 12 east-Andean forms probably have crossed the Andes, recently or earlier, north of Andalucia, perhaps even some of them north of Bogotá. Eight of them still occur in open terrain in higher zones or to the northward along such routes today. Crossing in the passes east of the town of Colombia in extreme northeastern Huila appears much more likely, ecologically, than at Andalucia.

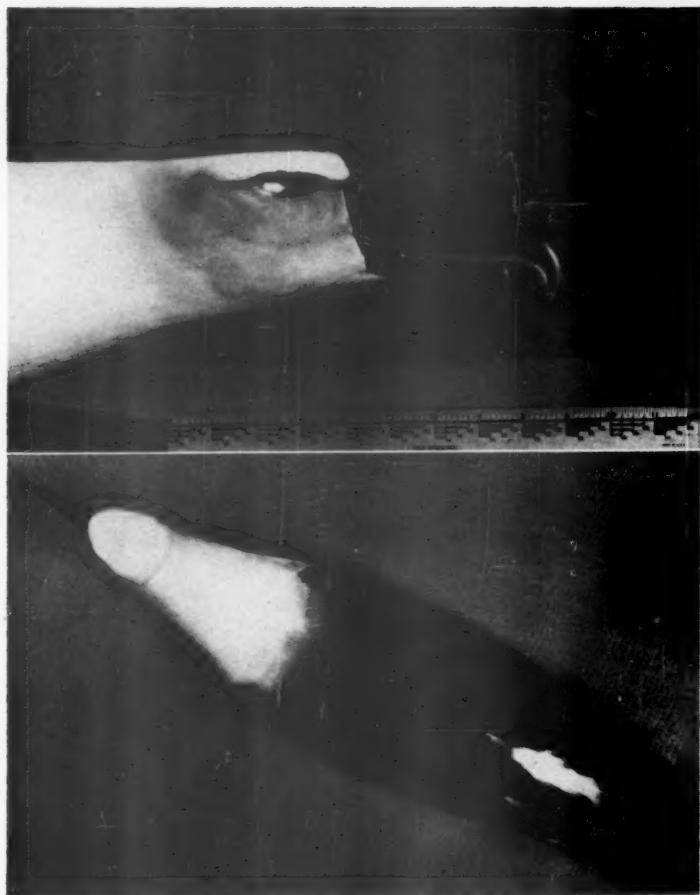
Museum of Vertebrate Zoology, Berkeley, California, November 14, 1951.

GENERAL NOTES

A Record of the Tasmanian White-capped Albatross, *Diomedea cauta* *cauta*, in American North Pacific Waters.—Despite their great size and interest, the albatrosses as a group remain among the least known of North Pacific birds. Recently Kenyon (Condor, 52: 97–103, 1950) has done much to clarify the status of the three resident species (*Diomedea nigripes*, *D. immutabilis*, and *D. albatrus*, the latter probably now extinct) in the northern and northeastern Pacific. The papers of Thompson (Auk, 68: 227–235, 1951) and others cited therein are also generally helpful toward the same end. J. K. Townsend's century-old records of southern hemisphere Tubinares reportedly taken off the mouth of the Columbia River in 1834 and 1835, including two species of albatrosses, *Diomedea chrysostoma* and *Phoebastria palpebrata auduboni*, have been doubted in recent years (cf. A.O.U. Check-list N. Amer. Birds, ed. 4: 366, 1931; and Stone, Auk, 47: 414–415, 1930; Auk, 48: 108–109, 1931; and Auk, 51: 225–226, 1934). Similar doubt is expressed regarding the authenticity of the record of a skull of the first named species from California (Grinnell and Miller, Pac. Coast Avif. No. 19: 557, 1944). However *D. chlororhynchos* has been twice recorded authentically on the coast of eastern North America (A.O.U., *op. cit.*), and *D. melanophrys* has been reported from Greenland (Hørring and Salomonsen, Medd. Grønland, 131 (5): 1941), all in the North Atlantic, where, incidentally, resident species of albatrosses are wholly lacking. From this and perusal of Peter's 'Birds of the World' (vol. 1: 41–46, 1931), Murphy's 'Oceanic Birds of South America' (vol. 1, 1936), and the 'Zoological Record' (1930–), it appears that the following description of the capture of an individual of *Diomedea cauta cauta*, the Tasmanian White-capped Albatross, constitutes the first published record of that species not only in the North Pacific but in the northern hemisphere as well, and the first known occurrence of the typical race in the waters of the Americas.

In the late summer of 1951 I was privileged through the kindness of Mr. Joseph G. Ellson, Chief, North Pacific Explorations and Gear Research section of the United States Fish and Wildlife Service, to accompany the research motor vessel, *JOHN N. COBB*, on a deep-trawling expedition off the Washington coast. On September 1 at 13:30 PST the crew was engaged in completing an otter trawl haul in 240 fathoms at 47° 55' N. and 125° 37' W., about 39 miles west of the Quillayute River mouth on the Olympic seacoast of Washington, when a large black and white albatross appeared in the congregation of Black-footed Albatrosses, *D. nigripes*, attending the ship. After consultation with those in charge I borrowed a gun and collected the specimen for positive identification and preservation. Dayton L. Alverson and Ernest O. Salo assisted in the capture, and Karl W. Kenyon of the U. S. Fish and Wildlife Service helped prepare and photograph the specimen.

Field and preparational data were as follows: length, 36 inches; wingspread, 8 feet 1½ inches; weight, 3890 grams (8.55 pounds); adult female; ovary 24 x 15 mm. with many ova 1–2 mm. in diameter and several apparent corpora lutea; a definite post-sternal brood patch; condition excellent, flesh full and sapid; fat accumulations, both subcutaneous and visceral; stomach contents none; no parasites noted; plumage fresh and clean; iris gray-brown; feet pale gray, somewhat dusky on joints and to some extent on webs; nails pale horn-colored, somewhat worn and irregular; mandibles in general pale gray, yellow-nailed—upper margined and invaded basally with black; fleshy rictal extension of gape narrowly rimmed with carmine, extending downward and forward onto base of lower mandible. In view of the taxonomic importance which has been attached to the colors of the beak (cf. Mathews, Bull.



TASMANIAN WHITE-CAPPED ALBATROSS, *Diomedea cauta cauta*



Brit. Orn. Club, 213, 1934) the following more detailed laboratory notes taken from the frozen specimen are also offered: culminicorn, latericorn, naricorn, ramicorn, and inter-ramicorn generally light gray with a slight yellowish tinge, equivalent to the "Oyster Gray" (19A2) of Maerz and Paul (A Dictionary of Color, 2nd ed., McGraw-Hill, 1950); nail of upper mandible rich corn yellow, of lower similar but clouded with dusky back of incisive border; ramicorns streaked medially with dusky; prenasal groove narrowly dusky, behind nostril caulked with prominent extension of black membranous ridge margining entire base of upper mandible; rictal extension of gape edged by narrow vivid carmine lip continuing down and forward nearly across lateral face of ramicorn. Standard measurements taken from the thoroughly dried skin are as follows: chord of culmen, 136 mm.; width of maxilla at base, 33.0 mm.; depth of closed bill at base, 54 mm.; tarsus, 92; middle toe with claw, 145; wing (chord) 584; and tail, 224. The prepared skin has been photographed (Plate 16) by University of Washington photographer, E. F. Marten. The subspecific identification is based on the very large size of the bird, particularly of the bill and feet, the color of the bill, and the white nape and pileum. Dr. Robert Cushman Murphy of the American Museum of Natural History has kindly examined this report, and the photographic materials upon which it is based, and concurs in the racial determination (Murphy, *in litt.*; see also Amer. Mus. Novit. No. 419, April 5, 1930).

The specimen consisting of the skin and body skeleton is cataloged as Number 1616 in the Slipp collection at Pacific Lutheran College, Parkland, Washington, with provision for its transfer to the United States National Museum.

Efforts to account for erratic occurrences of sea birds far from their normal range are usually futile. However, we can say positively that in the present case there is no doubt that the specimen was a wild bird which had arrived on the scene by means of its own powers of flight, for its size and nature would render it a most unlikely captive, and its immaculate and unfrayed plumage testify to freedom and normal good health. It seems inconceivable, likewise, that it might have been tolled so far from its native waters by any one ship, although it showed no very great reluctance to joining the flock of "goonies" around the *JOHN N. COBB* and may well have traveled long distances in the company of ships encountered in its wanderings. Cyclonic wind storms are known to be a frequent cause of long distance transfers of sea birds from the tropics to higher latitudes (Murphy, 1936: 50-59), possibly accounting for a part of the extreme dislocation in the present case. The unprecedented nature of this record suggests that whatever combination of the above agencies may have been operative, a large residual allowance must be made for individual caprice on the part of the bird itself. We can hazard little more to account for the appearance of a relatively localized subspecies (*cf.* Murphy, 1936) some 8,000 miles away, across the tropic barrier, from its native islands.—J. W. SLIPP, School of Fisheries, University of Washington, Seattle 5, Washington.

West Indian Black-capped Petrel, *Pterodroma hasitata*, Picked up on Fairfield Beach, Connecticut.—On October 7, 1938, a bird was found on Fairfield Beach and brought to Birdcraft Museum. It was smeared with fuel oil and appeared to have been dead for two or three days. Mr. Frank J. Novak, curator, mounted it and placed it in one of the cases as a Greater Shearwater, *Puffinus gravis*. While visiting the museum last June, Dr. Robert C. Murphy at once noted the bird and said that it was not a shearwater but one of the rare specimens of Black-capped Petrels. Later in the summer Mr. Novak and I took the mounted bird to The American Museum of Natural History for comparison with other specimens. Dr. Murphy examined it very carefully and made the following comment: "The disas-

trous hurricane of 1938 crossed the position of Fairfield, Connecticut, late on September 21st. Presumably the black-capped petrel was a West Indian waif carried northward in the course of this tropical storm which entered the area of the normal range of the species about September 18th. The bird probably died in northern waters some 12 or 13 days after the passage of the storm.

"The Fairfield specimen, an adult female, has been compared with six other examples of the black-capped petrel, several of which represent earlier North American records taken after the passage of hurricanes. It is typical in all respects of the species. The measurements are recorded below, but it should be noted that dimensions of tarsus and toe were taken from the mounted bird and are therefore likely to show slight disagreement with the same measurements taken in the conventional manner from study skins." Wing, 280 mm.; tail, 123; exposed culmen, 31.5; tarsus, 36; and middle toe and claw, 53.2 mm.—JOHN P. HOLMAN, *Birdcraft Museum, Fairfield, Connecticut*.

A Record for the Black-capped Petrel, *Pterodroma hasitata*, in Martinique.—Recently I have received for identification a small collection of bones from Martinique, forwarded by P  re R. Pinchon, from excavations in Carib shell middens at Paquemar, near the coast, three kilometers south of the settlement of Vauclin, in the southeastern part of the island. Associated here with pottery fragments, stone tools, and bones of turtle, iguana, and extinct mammals was a fragmentary section of the proximal end of a humerus that is unquestionably that of a petrel of the genus *Pterodroma*. While broken, in size and available characters this agrees with *P. hasitata*, and I have identified it as this species. With it were bones of the Broad-winged Hawk (*Buteo platypterus*), Purple Gallinule (*Porphyrio martinica*), and two species of pigeons (*Zenaida aurita* and *Columba squamosa*).

The Black-capped Petrel has been recorded in the Lesser Antilles on Guadeloupe and Dominica, but the only previous report for Martinique has been that of L'Herminier (Proc. U. S. Nat'l. Mus., 1: 451, 1879). This naturalist includes it in a list of species, without data other than the name, observed between 1827 and 1844 on Guadeloupe and Martinique. Bond (First Supplement to the Check-List of Birds of the West Indies (1950), 2, 1951) recently examined these early observations, which have been almost forgotten, and believes that they are valid. The Paquemar specimen thus is verification of this earlier report.

The age of the deposits, which were excavated between 1947 and 1951, is uncertain, except that they are pre-Columbian. P  re Pinchon very kindly has allowed the petrel bone to remain in the U. S. National Museum where it is preserved in the collections in the Division of Birds.—ALEXANDER WETMORE, *Smithsonian Institution, Washington 25, D. C.*

***Oceanodroma tethys tethys*, a Petrel New to the North American Avifauna.**—In 1938 (Auk, 55: 256, 1938) James Moffitt recorded specimens in the collection of the California Academy of Sciences at San Francisco, which he regarded as *Oceanodroma tethys kelsalli* and which he thought were eligible for inclusion in the North American check-list of the American Ornithologists' Union.

These specimens had been collected by the Academy's Galapagos expedition in 1905, at sea, Latitude 22° 30' N., Longitude 112° 39' W., which is approximately 175 miles west of the tip of the peninsula of Baja California, Mexico. The A.O.U. Committee later rejected Moffitt's record on the grounds that the point of capture was too far off shore to come properly within the limits of the range allowed for the check-list.

On January 31, 1950, Mr. J. R. Hendrickson, who was a student guest on board Mr. J. W. Sefton's research ship *ORCA*, collected a number of *Oceanodroma* petrels from rock crevices on the hillsides of Melpomene Cove, situated on the southern end of Guadalupe Island, Baja California, Mexico.

Among the lot was a very small petrel, *Oceanodroma tethys tethys*, which Mr. Sefton set aside to be presented to the San Diego Society of Natural History, of which, at the time, he was President.

The bird was in a refrigerated condition when delivered to the writer, a week or more later, for preparation. It was found to be a male with testes about three millimeters in length and thus not in breeding condition. It is now No. 29900 in the collection of the San Diego Society of Natural History.

Mr. Sefton stated that the petrel had been taken from a crevice by Mr. Hendrickson where it was found in the close company of a young *Oceanodroma leucorhoa socorroensis*, which was also brought in the flesh to the writer. The body of this juvenile petrel was still well clothed in natal down, but the wing and tail feathers were about half-grown, with the wing coverts and feathers of the white rump patch out of the quills and almost clear of down. It was over twice the bulk of the tiny *Oceanodroma tethys*.

Another, as yet unrecorded, specimen of *Oceanodroma tethys tethys* (No. 18014, San Diego Society of Natural History) was presented to the Society several years ago by Mr. J. R. Pemberton. This bird was collected by Mr. Pemberton, March 21, 1938, at Roca Partida, a dangerous barren rock in the Revilla Gigedo Islands, lying between 18° 20' and 19° 20' N. and 110° 45' and 114° 50' W. This locality is not as near Baja California as is the locality recorded by Mr. Moffitt but adds another northern locality of capture for this tiny petrel.

These two petrels were submitted to Dr. Alexander Wetmore for critical identification and his reply was as follows:

"*Oceanodroma tethys tethys*. The specimen from Guadalupe Island is a little small and so is on the borderline between the typical race and *kelsalli*. I think, however, that it should be determined as I have marked it. I may note that there is considerable variation in form of bill in these birds. Your specimen from Roca Partida is also small but comes within the lower limit of measurement of the typical race."

The writer wishes to express his thanks to Dr. Wetmore and Mr. Sefton for their parts in establishing this important record.—LAURENCE M. HUEY, *Natural History Museum, Balboa Park, San Diego, California*.

Captive Whooper Swans, *Cygnus cygnus*, Kill Other Waterfowl.—On May 27, 1950, I saw a Whooper Swan, kill a Mallard duckling, *Anas platyrhynchos*. Two Whooper Swans, six Canada Geese, and three adult Mallards were eating bits of bread thrown into the water. Another adult female Mallard with four ducklings about one week old swam up and joined the feeding. As the group passed near one of the swans, the swan grasped a duckling and thrust it under water for a few seconds. When released, the duckling popped to the surface and swam rapidly around in circles as though confused. The swan grasped it again and thrust it under water briefly as before. This time when released, the duckling floated to the surface, belly-up and without movement. The adult Mallard paid no attention to the proceedings.

Within 30 seconds, I retrieved the duckling. Its heart had stopped. There were no external injuries but blood dripped from its mandibles. From this blood and the abruptness of the death, I concluded that death had resulted from the pinch rather than from drowning.

The waterfowl at this rural location (Oak Openings Park, 20 miles west of Toledo, Ohio) are pinioned but not fenced in or restrained in any other way. Earlier in the season Canada Geese, Snow Geese, and other Mallards had nested around the pond or on the numerous islands in it. The swans had not attempted to nest here.

I related this incident to Arthur E. Staebler at the Kellogg Bird Sanctuary, near Battle Creek, Michigan, where the swans were obtained. He said that he attributed to Whooper Swans the deaths of at least five young Canada Geese (up to the size of adult Mallards) and one adult Canada Goose the same spring. He did not have an opportunity to observe the details, but the method seemed to be the same as described here.—HAROLD MAYFIELD, 2557 Portsmouth Ave., Toledo 13, Ohio.

First Flight of Trumpeter Swans, *Cygnus buccinator*.—During the morning of June 16, 1951, the last of three Trumpeter Swan cygnets was hatched from a clutch of five eggs on a small pond near Jackson Lake, Grand Teton National Park, Wyoming, at an elevation of approximately 6,750 feet. On October 4, and occasionally thereafter until October 14, the young were checked for ability to fly. On October 14 one cygnet was able to take off and circle the pond with its parents for approximately three minutes before it disappeared from view. Another of the cygnets was able to reach a height of about 20 feet and to circle the pond once; the third was unable to arise from the water. Using October 14 as a fair date for first flight of this family of cygnets, 120 days elapsed from hatching to first flight. On October 16 the whole family left the pond for the season.

The pond was frozen November 2. With development of approximately four months in this case, it is significant that some of the swans of the region, reared on shallow ponds at much higher altitudes (up to 7,800 ft.) and consequent shorter periods of open water if thermal areas are not involved, may not reach the flight stage.—JAMES R. SIMON, Jackson Hole Wildlife Park, Moran, Wyoming.

Introduction of the Domestic Pigeon.—Recently there has been an epidemic of trichomoniasis (canker), caused by *Trichomonas gallinae*, among the Mourning Doves, *Zenaidura macroura*, in the southeastern states. The outbreak has prompted the suggestion that the extinction of the Passenger Pigeon, *Ectopistes migratorius*, was due to the acquirement of this disease from the Domestic Pigeon, *Columba livia*, or other birds (Stabler and Herman, Trans. 16th N. Amer. Wildl. Conf., 1951: 159). Disease, particularly "canker," has been frequently suggested as the cause of the disappearance of the Passenger Pigeon, but there is no record of the finding of pigeons that had died of disease. Contrary to the general belief, the Domestic Pigeon was introduced by the earliest colonists. "Canker" is an old disease among Domestic Pigeons and was mentioned by Moore ('Columbarium,' 1735: 16). In fact the Passenger Pigeon had an opportunity to acquire trichomoniasis, or any of the other diseases to which the Domestic Pigeon is heir, over a period of three centuries.

The first introduction of the Domestic Pigeon appears to have been by the French. Lescarbot ('History of New France,' 3:226, 232, 1914) wrote of Port Royal, Nova Scotia, in 1606, that the only domestic animals were hens and pigeons, and added: "There are such a quantity of them [eagles] in those parts that often they ate our pigeons, and we had to keep a sharp look-out for them." A plate in Champlain's 'Works' (2: plate IV, op. p. 39, 1925) shows the *Colombier* of his "habitation" built at Quebec in 1608. The 'Jesuit Relations' (28: 145, 1948; and 30: 153, 1898) of 1646 and 1647 mention gifts from the Governor of Canada of eight young pigeons (*pigeonneaux*) and six pigeons (*pigeons*). Boucher ('Histoire veritable du Canada,' 1664: 73) says: "Les oyseaux que l'on apporté de France, sont Poules, Poules-d'Indes,

et des Pigeons." Eight years later Denys ('Histoire naturelle,' 1672: 333) was to accuse the mink and weasel of making war against the hens and pigeons (*aux poules, aux pigeons*).

The English were little behind the French. The Council of the Virginia Company ('Records,' 3: 532, 1933) sent a letter, dated December 5, 1621, to the Governor and Council in Virginia stating that "Pidgeons" and other commodities were being forwarded, "the preservation & encrease whereof we recomend vnto you."

Lucy Downing ('Winthrop Papers,' Mass. Hist. Soc., 4: 343, 1944) wrote to Governor John Winthrop in Massachusetts, about 1642: "I hope some piggions are come to your hands and more had bin sent if I had had a larger thinge to put them in, but if you pleas to return the cage it shall be filld agayne." At Westover, Virginia, William Byrd ('Secret Diary,' 1941: 505) was raising pigeons. On March 24, 1712, his people raised the "pigeon house" to place pillars beneath it.

An entry in the journal of Diron D'Artaguiette, made at New Orleans on September 11, 1722, mentions that men were being employed to build a pigeon house (Mereness, 'Travels in the American Colonies,' 1916: 23).

The French had pigeons in the Great Lakes region at the beginning of the eighteenth century. Detroit was founded by Cadillac in 1702. The inventory of his estate in 1711 contains the item: "Also a dove-cot raised on four wooden posts six feet high, ten square . . ." (Mich. Hist. Colls., 33: 519, 664, 1904). This dovescote was valued at 400 livres in 1720. In 1712 Dubuisson (Mich. Hist. Colls., 33: 538, 1904) complained that the Indians at Detroit subjected him to a thousand insults, one of which was the killing of pigeons.

Pigeons were raised in considerable quantities at Fort de Chartres (Kaskaskia), Illinois. Morgan (Ill. Hist. Colls., 16: 481, 1921) wrote from this post in 1768: "I have a pigeon House built in the Shape of Parson Smith's Folly & full as large—It contains more than two hundred couple—there had been at one Time upwards of five hundred Couple in it as the House was vacant a long While before I removed here & no care taken of them they are greatly diminished . . ." Regarding this fort De Peyster (Wis. Hist. Colls., 11: 136, 1888) reported in 1779 that there were "a few Swivels mounted in Pidgeen Houses."

While in Florida in 1773, William Bartram ('Travels in Georgia and Florida,' Trans. Amer. Phil. Soc., 33, 2: 150, 167, 1943) wrote that the chicken snake climbs the dovescotes and destroys the eggs and young of the pigeons.—A. W. SCHORGER, *Department of Wildlife Management, University of Wisconsin, Madison, Wisconsin.*

The Nomenclature of Certain Bulbuls (*Pycnonotus*): a Reconsideration.—The Marquess M. Hachisuka, in 'Contributions to the Birds of Hainan' (Orn. Soc. Japan, Suppl. Publ. No. 15, October 30, 1939) named "*Otocompsa jocosus hainanensis*" (p. 74) and "*Molpastes cafer insularis*" (p. 75), each based upon a single specimen in the Momiya Collection from "Nauchan, Hainan." Since no other example of either of these familiar door-yard species has ever been reported from Hainan, I felt bound to assume, in my revisions of *Pycnonotus jocosus* (Journ. Wash. Acad. Sci., 38: 279-281, 1948) and of *Pycnonotus aurigaster* (*ibid.*, 39: 274-277, 1949), that Hachisuka's types were escaped cage birds, representative of some well-known continental race.

I have recently learned that "Nauchan, Hainan" is an imaginary locality, and that the types came, in fact, from Naochow (an island in the French territory of Kwangchow, off the southern coast of Kwangtung), where the two species are common. In the light of this new knowledge, I wrote to the Marquess Hachisuka for further details, which are now at hand. Since data for the type specimens at the

original descriptions are insufficient, or even faulty, it seems well here to record the true data, derived from Hachisuka's reexamination of the two specimens, which are still extant in Tokyo as part of the Momiyama Collection.

The type of "*Molpastes cafer insularis*" carries three labels. The oldest, written in Japanese by Zensaku Katsumata, the collector, gives the locality as "Nahachau" (collector's pronunciation), and the date as January 1, 1907 (according to the Japanese calendar); the second, written by Owston, gives the locality as "Nauchau, Hainan" (with the final "u" resembling "n"), the date as January 1, 1906, and a serial number "64-06.0007"; the third label is that of Momiyama.

The type of "*Otocompsa jocosa hainanensis*" carries but two labels (Katsumata's has been lost). The older one, written by Owston, gives the locality as "Nauchau, Hainan," the date as January 5, 1906, and a serial number "63-06.0008"; the newer label is that of Momiyama.

The serial numbers indicate that the two must have been collected in the same year, and it is reasonable to assume that Katsumata, writing by the Japanese calendar, was correct in giving the year as 1907, especially since seven Naochow specimens of "*insularis*" and eight of "*hainanensis*" in the American Museum of Natural History, acquired by Rothschild from Owston, and kindly sent me by Dr. Ernst Mayr, are all dated as taken between January 1 and January 5, 1907, inclusive. Moreover, the type of *Aethopyga seheriae owstoni* Rothschild, similarly obtained from Owston, was collected on Naochow on January 6, 1907. According to Hachisuka, Katsumata worked in Hainan from March, 1902, to the end of 1906, visiting Naochow only at the beginning of 1907, on his way back to Japan.

"*Otocompsa jocosa hainanensis*," which should now be known as *Pycnonotus jocosus hainanensis*, seems in fact to be separable from *P. j. monticola*, with which I tentatively synonymized it in my revision, if not by most of the characters relied upon by Hachisuka, at least by having the smoky-buff suffusion, that tinges the flanks and lower abdomen of *monticola*, spreading over the upper abdomen, breast, and lower throat as well. Moreover, birds of *hainanensis* type are not restricted to Naochow but seem to range southward into northern Annam. This requires that the range given by me for *P. j. monticola* be limited to Sikkim, Bhutan, Assam, northern Burma and the Shan States, and western Yunnan; the range of *P. j. hainanensis*, on the other hand, will be Naochow Island, western Kwangtung, eastern Tongking, northern Annam, and probably western Kwangsi and southeasternmost Yunnan.

"*Molpastes cafer insularis*," which should hereafter be known as *Pycnonotus aurigaster resurrectus*, new name (see below), similarly proves to be distinct from *P. a. chrysorrhoides*, with which I tentatively synonymized it, if not by all the characters assumed for it by Hachisuka, at least by the fact that the entire under parts are suffused with smoky buff, instead of being a more or less uniform sullied gray. Here I must restrict the range given by me for *P. a. chrysorrhoides* to Fukien, eastern Kwangtung, and Hongkong, while that of *P. a. resurrectus* will include Naochow Island, western Kwangtung, eastern Tongking, northernmost Annam, and probably western Kwangsi and southeasternmost Yunnan.

The Marquess Hachisuka has brought to my attention that, when *Molpastes* is submerged into the genus *Pycnonotus*, his name *insularis* becomes preoccupied, and has invited me to supply new names where necessary.

For *Molpastes cafer insularis* Hachisuka (Orn. Soc. Japan, Suppl. Publ. No. 15: 75, 1939 [Naochow Island, Kwangchowan]), not *Pycnonotus plumosus insularis* Chasen and Boden Kloss, 1929, I now propose

Pycnonotus aurigaster resurrectus, new name.

When *Andropadus* is reduced to a subgenus of *Pycnonotus* (see Delacour, *Zoologica*, 28: 17-28, 1943), the name of the Bornean bird becomes preoccupied within the genus. Therefore, for *Pycnonotus plumosus insularis* Chasen and Boden Kloss (*Journ. für Orn., Ergänzungsb.*, 2: 115, 1929 [Banggai Island, North Borneo]), not *Andropadus insularis* Hartlaub, 1861, I propose

Pycnonotus plumosus hachisukae, new name.

This is perhaps as suitable a place as any other to point out that when, following Delacour (*loc. cit. supra*), the "genus" *Stelgidocichla* is reduced to a synonym of *Andropadus*, which in turn becomes a mere subgenus of *Pycnonotus*, at least one other bulbul, this time African, requires renaming. For *Stelgidocichla latirostris pallida* Mearns (Smiths. Misc. Coll., 61: 5, 1914 [Mount Gargues, Kenya Colony]), not *Pycnonotus layardi pallidus* Roberts, 1912, I here propose, in honor of John George Williams, of the Coryndon Museum, Nairobi,

Pycnonotus latirostris williamsi, new name.

H. G. DEIGNAN, *Smithsonian Institution, Washington, D. C.*

Observations on Remating in the American Robin, *Turdus migratorius*—In suburban Baltimore, from 1942 through 1950, I color-banded both members of 15 pairs of Robins. At the end of 1951 the record of returns and rematings showed the following: 1) Both members of eight pairs returned in the year following their first known mating; there was one remating; 2) Both members of one of the pairs returned in two successive years; these birds never remated; 3) In the seven instances in which only one member of a pair was found in the following year, five times this was the female and twice the male.

One Robin remating out of 8 possibilities (12 per cent) compares with 8 out of 30 (27 per cent) in the Song Sparrow, *Melospiza melodia*, reported by Nice (*Trans. Linn. Soc. New York*, 6: 182, 1943), and 11 out of 26 (42 per cent) in the House Wren, *Troglodytes aëdon*, reported by Kendeigh (*Ill. Biol. Monog.*, 18 (3): 56, 1941).

The Remating.—The remating occurred in 1950. It seems attributable to the faithfulness of both birds to their territory, and their almost simultaneous arrival in spring.

The male had been banded in the spring of 1947 and returned to the same territory through 1950. During that time I located nine of his nests and, although he had three mates during the four years, all nine nests were built within a radius of 40 yards. The female was banded in the spring of 1949 and on through 1951 has been equally true to the same territory. In 1950 the female returned on April 2; I first saw the male April 4, but believe he could have arrived April 3.

Failures to Remate.—Of the seven failures to remate, two are definitely attributable to circumstances just the reverse of those set forth above; one bird (both times the male) was unfaithful to territory, and the members of the pairs returned on widely different dates.

In 1951 Male No. 1 returned to his 1950 territory on February 13, but for some reason moved on March 12 to new ground appreciably to the north. On March 8 Male No. 2 returned to his 1950 territory, which was about 125 yards northeast of Male 1's old area, and expanded it a bit east and south to include part of the 1950 territory of Male No. 3. On April 6 Male 3 returned and, presumably because of opposition now on his 1950 territory, moved into the one that Male 1 had vacated. On April 7 the 1950 mate of Male 1 returned precisely to territory and paired with

the new occupant, Male 3. Still later the 1950 mate of Male 3 returned to, or close to, their old territory; her pairing there was not determined.

Unfaithfulness to territory may have been a factor in two other failures: one male was carried in dead by a cat, at the beginning of a season, at a house about 150 yards from the bird's previous territory; one female, not located until a late nesting, was then about 100 yards from her previous territory. In another case the female returned a few days before her old mate, and possibly was paired before his arrival; it was she who reoccupied the center of the old territory; he shifted a little when he returned. My observations were inadequate to provide explanations of the other two failures.

Kendeigh (*loc. cit.*) concluded that in the House Wren, similarly, "lack of remating is often due to a scattering of birds into other, although nearby, areas, while remating is greatly aided by both birds returning to the same old nesting grounds."—HERVEY BRACKBILL, 4608 Springdale Avenue, Baltimore 7, Maryland.

A Warning Call of the American Robin, *Turdus migratorius*.—In nesting-time, American Robins of both sexes at times utter a high-pitched yet weak-sounding note that closely resembles that of the Cedar Waxwing—a thin 'see-eeep.' When uttering this note, the Robin remains rigid, often for several minutes. It is an alarm, giving warning of a predatory bird or birds, and is intelligible to birds other than Robins, even to domestic poultry. Bent (U. S. Natl. Mus. Bull. 196: 36, 1949) lists no such note.

Six years' observation have failed to show us an instance where this call arose from the presence of an animal, such as a cat or a raccoon. A somewhat confusing factor is that Robins assail predatory birds with outcries similar to those with which they scold their earthbound enemies. We therefore believe the function of the call is to alert other birds.

This belief is strengthened by the behavior of an orphaned robin we reared. This month-old bird uttered the alarm while in a room with drawn blinds. The bird, which had been preening its feathers while perched on my finger, remained tense for a couple of minutes despite my efforts to soothe and relax it.

My wife had been outdoors and when she re-entered, I asked her if she had seen a hawk. She replied that she had been trying to see one, but had failed. When I asked her why she had been trying, she said, "Several robins were 'see-eeeping'."

The next day, while at a window, the young bird again uttered the note. Binoculars showed me a small hawk and two larger hawks in a dead tree, 135 yards distant. To my unaided vision they appeared three specks, but glasses identified them as Goshawks, *Accipiter gentilis*, and a Sharp-shinned Hawk, *Accipiter striatus*. Previously, when 18 days old, this Robin gave the warning faintly, yet recognizably, on seeing a Cooper's Hawk, *Accipiter cooperii*, pass a window.

This young bird supplied the only instances we have had of a juvenile robin uttering this particular alarm note. The call is not chorused as in a general alarm, but is repeated by individuals at scattered points. Not only hawks, but any predatory bird may cause a Robin to utter this alarm. And, though some Robins winter here, we hear it only in nesting-time.—MORRIS JACKSON, R. R. No. 1, Fanny Bay, British Columbia.

Notes on Song Cessation.—When the breeding of a bird population is over, song usually ceases gradually. The first marked decline in the number of daily songs is the beginning of cessation; general cessation marks the end of singing for the

species as a whole, even though a few individuals may sing after this date. This subject has received careful treatment by Saunders (Auk, 65: 19-30, 1948).

From July 5 through August 28, 1950, notes on the song cessation of several species of birds were recorded in the region of Pymatuning Lake, Crawford County, Pennsylvania. During the summer of 1949 songs of the Red-wing, *Agelaius phoeniceus*, were recorded in the same area. Records of the number of songs and of individuals singing were made between 6:30 and 9:30 a. m. when paths were followed on foot along the edge of two small marshes, through three fields with some shrubby growth, and through a deciduous wooded area.

TABLE 1

SONG CESSATION OF BIRDS AT PYMATUNING LAKE, CRAWFORD COUNTY, PENNSYLVANIA

Species	Beginning of cessation	General cessation	Last song
Mourning Dove, <i>Zenaidura macroura</i>	July 13	July 20	July 23
House Wren, <i>Troglodytes aëdon</i>	July 23	July 25	August 12
Catbird, <i>Dumetella carolinensis</i>	July 20	July 23	July 26
Wood Thrush, <i>Hylocichla ustulata</i>	July 25	July 29	July 31
Veery, <i>Hylocichla fuscescens</i>	July 9	July 13	July 13
Red-eyed Vireo, <i>Vireo olivaceus</i>	August 12	August 16	August 26*
Yellow Warbler, <i>Dendroica petechia</i>	July 25	July 28	July 30*
Red-wing, <i>Agelaius phoeniceus</i>	{ July 8, 1949 July 13, 1950	{ July 22, 1949 July 20, 1950	{ Aug. 31, 1949 July 26, 1950
Common Goldfinch, <i>Spinus tristis</i>	August 7	August 12	August 28
Song Sparrow, <i>Melospiza melodia</i>	August 12	August 17	August 27

* These records may indicate the revival of song by some individuals after the postnuptial molt.

The beginning of cessation, general cessation, and the last song are recorded for the Mourning Dove, House Wren, Catbird, Wood Thrush, Veery, Red-eyed Vireo, Yellow Warbler, Red-wing, Goldfinch, and Song Sparrow in Table 1. The dates of song cessation check well with the extent of the nesting season given for these species by Todd (Birds of Western Pennsylvania, Univ. Pittsburgh Press, 1940), the dates

TABLE 2

LAST SONGS OF BIRDS AT PYMATUNING LAKE, CRAWFORD COUNTY, PENNSYLVANIA

Species	Last song
Eastern Phoebe, <i>Sayornis phoebe</i>	August 12
White-breasted Nuthatch, <i>Sitta carolinensis</i>	July 25
Yellow-throat, <i>Geothlypis trichas</i>	August 7
Scarlet Tanager, <i>Piranga olivacea</i>	July 13
Henslow's Sparrow, <i>Passerherbulus henslowii</i>	August 13
Eastern Vesper Sparrow, <i>Pooecetes gramineus</i>	July 25
Eastern Field Sparrow, <i>Spizella pusilla</i>	August 12
Swamp Sparrow, <i>Melospiza georgiana</i>	August 13

for song cessation coming somewhat after the majority of the members of a species have stopped nesting activities. In the case of the Phoebe, White-breasted Nuthatch, Yellow-throat, Scarlet Tanager, Henslow's Sparrow, Vesper Sparrow, Field Sparrow, and Swamp Sparrow, insufficient data made the trend of song cessation impossible to chart. Only the dates of last recorded songs of these species are shown in Table 2.

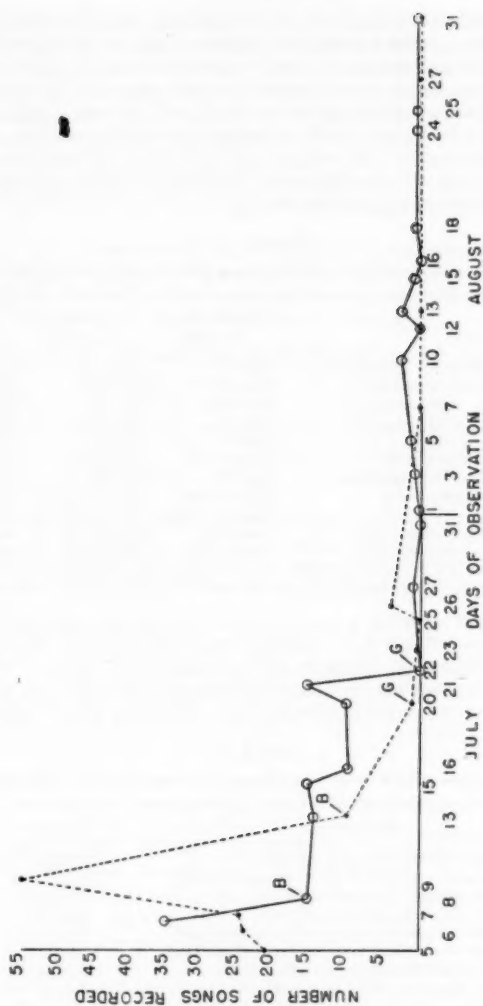


FIGURE 1.—Songs of the Red-wing recorded between 6:30 and 9:30 a. m. Days in 1949 designated by hollow circles; days in 1950, by solid circles. B indicates the beginning of cessation; and G, the general cessation.

There are differences in the period of song decline of the species studied, as little as four days between the beginning of cessation and the last song of the Veery, and as much as three weeks for the House Wren. With the exception of the Veery there were songs recorded for the remaining species after the general cessation. A comparison of the data with those recorded by Saunders (*loc. cit.*) in New York and Connecticut shows a similarity in the period of song decline for most of the species.

It is interesting to note how closely the dates of the beginning of cessation and general cessation approximated each other for the Red-wing during the summers of 1949 and 1950 in the Pymatuning region, only five days difference for the former and two days for the latter. Song decline continued over a ten-day period in 1950, in comparison to the two-week period of 1949. The data concerning the Red-wing are in Table 1 and Figure 1.

On July 26, 1950, the last songs of the summer were recorded for the Red-wing. There is a wide variation between this date and that of 1949 when the last song was heard on August 31. However, the few songs recorded in August of 1949 and the last songs in July of 1951 were often harsh or incomplete or both. These songs recorded from August 5 through August 31, 1949, are of special interest since no song of this species has been recorded so late in the summer. Bicknell (*Auk*, 2: 250, 1885) recorded one on August 3. Harshness was also noted in the last songs of the Yellow Warbler in 1950. There is some question as to whether the dates recorded for the Red-eyed Vireo and Yellow Warbler in Table 1 represent the last song of the summer or a revival of the song after the postnuptial molt. A number of birds revive singing after this molt is over; but certain species revive the song so soon after cessation that distinguishing between the two conditions is difficult (Saunders, *Auk*, 65: 373-383, 1948).

SUMMARY

1. The number of songs was recorded for several species in the Pymatuning area of northwestern Pennsylvania during three-hour intervals in the summer of 1950, and for the Red-wing during the summers of 1949 and 1950.
2. The beginning of cessation and general cessation was determined for ten species, and the last song was recorded for 18 species.
3. The Veery showed the shortest period of song decline, four days, while the House Wren's song declined over a period of three weeks.
4. Several very late songs were recorded for the Red-wing during August, 1949.—
JOHN F. MEHNER, *Contribution No. 2, Pymatuning Laboratory, Department of Biological Sciences, University of Pittsburgh, Pittsburgh, Pennsylvania.*

NOTES AND NEWS

It would be impossible to name here all the individuals who have helped in the preparation of this volume. Our journal is becoming more and more of a community effort. This is well, for no one individual can or should do all the work. Many different ornithologists over the world have gathered citations to the literature. Some have carried the main burden of critical reviews of major articles. Others have read manuscripts and given valuable editorial suggestions. The Illustrations Committee has assumed a great deal of the work of selecting, advising on, and actually preparing illustrations.

Letters containing sincere suggestions and constructive criticism have been helpful, and have shown a widespread and deep interest in all parts of 'The Auk.'

Those who have labored to provide the necessary financial support for publication are also important parts of the "journalistic mechanism" of our organization.

A heartfelt "thank you" to all who have helped me during my editorship.—
HARVEY I. FISHER.

The new Editor of 'The Auk' is Dr. Robert W. Storer,
Museum of Zoology,
University of Michigan,
Ann Arbor, Michigan.

His duties begin with the January number of 1953.

THE "Proceedings of the Tenth International Ornithological Congress" held in Uppsala, in June 1950, are now available for purchase from Professor Sven Hörstadius, Zoologiska Institutionen, Uppsala, Sweden. Book dealers may order it from Almqvist and Wiksell, Uppsala, Sweden. The price is 35 Swedish crowns (\$6.75 U. S.).

The volume covers the proceedings of the Congress, and some 83 papers presented before the meetings under four main headings—Evolution and Systematics, Migration and Orientation, Behavior, and Regional Faunas. The book is paper bound in attractive form, with 662 pages (531 in English, 28 in French, 93 in German), 1 color plate, 30 photographs, 125 maps and diagrams, and 46 tables. The edition only includes copies for the members of the Congress and a small number in addition for sale. Those interested in purchasing should order without delay as the number available is limited.

RECENT LITERATURE

An Analysis of the Distribution of the Birds of California. Alden H. Miller. Univ. Calif. Publ. Zool., 50 (6): 531-644, 9 pls., 5 figs., 1951. \$1.50.—This analysis of bird distribution in California is treated from the point of view of life-zones, plant communities and physical habitats, and faunal groups. The point is emphasized that no one system is entirely satisfactory, but each expresses certain truths not brought out by the others.

Although the actual characteristic of temperature that is important may not be known, there is no doubt that easily recognizable belts of life occur on mountain slopes correlated with a temperature gradient. The author indicates that a weakness of the life-zone system lies in the correlation of zones on distant mountain slopes (p. 616) and extending the concept into a continent-wide plan (p. 532). In California, about one-fifth of the 260 non-marine species tabulated are confined to one zone, most species range over two or three zones, and a very few occur in four or more zones. The greatest differences between the zones occur between the Transition and Upper Sonoran and between the Transition and Canadian. Because of the considerable resemblance between the Canadian, Hudsonian, and Alpine-Arctic zones, it is proposed that only four major life-zones be recognized in the state, *viz.*, Lower Sonoran, Upper Sonoran, Transition, and Boreal.

Some 274 species are rated subjectively as to their preference for, or their maximum populations in, different "formations." The "formations" considered are not only plant formations in the strict sense but also plant associations and physical habitats and include desert scrub, sagebrush, chaparral, piñon-juniper woodland, oak woodland, riparian woodland, savanna, grassland, alpine meadow, coastal forest, montane forest, subalpine forest, inland cliffs, sea cliffs, seashore, fresh-water marsh, salt-water marsh, lacustrine waters, fluvial waters, marine littoral waters, and pelagic waters. The listing of bird species by plant communities and habitat and the evaluation of their degree of restriction to each is very welcome information to avian ecologists in other parts of the country. It is hoped that population-counts in the future will make possible both a more objective preference rating of the species and an indication of the order of abundance of the species in each community.

The reviewer misses the recognition of any forest-edge communities. In studying the lists of birds for the forest communities, he often wondered whether a species really belonged to the forest itself or belonged to seral shrub stages or forest-edges that were locally included. There is, however, a strong resemblance between the bird-fauna of the deciduous riparian woodland and the savanna with what the reviewer has called the deciduous forest-edge community in the east. Several wide-ranging species that are listed as inhabiting several vegetation units could logically also be assigned to a forest-edge animal community. A primary characterization of communities of this type is that their constituents make use of different adjacent types of vegetation for their various needs.

The impression gathered from studying this paper is that the author has found plant communities more useful than the life-zones for analyzing the bird distribution in the state because (p. 581) they are more finely differentiated (21 units compared with 4) and because the distribution of the community units reflects the influence of all climatic or environmental factors rather than temperature alone. However, it is stated that the distribution of some species seems more clearly defined by life-zones than by the smaller plant community and habitat units. The agreement between the distribution of particular species and particular life-zones appears to

be more frequent for the less common species and for species belonging to plant communities of restricted range.

The reviewer counts 54 species confined to a single life-zone. In checking these species against the lists for the plant communities, he finds 26 species also restricted to a single plant community, 24 species found in two communities, only three species in three communities, and only one species in as many as four communities. Furthermore, many of those species found in two communities occur in closely related ones, such as fresh-water and salt water marshes, montane and subalpine forests, desert scrub and riparian woodland, and other similar combinations where the plant composition or habitat differs somewhat but where there is some question whether two recognizably distinct animal communities actually exist.

The essential unity in the bird composition of the coastal, montane, and subalpine forests, mentioned by the author, is in harmony with the conclusions reached by Hayward (Great Basin Nat., 6: 1-124, 1945) for the Wasatch and Uinta mountains in Utah and by Snyder (Condor, 52: 17-27, 1950) for the Rocky Mountains in Colorado. Furthermore, there is considerable resemblance among these three geographical areas in the species composition of this single coniferous forest animal community. There is interest also in the close relationship between the birds of the piñon-juniper and oak woodlands, which plant ecologists list as associations in one formation and which probably also represents a single animal community in the biome system.

The author refers to his classification of plant communities and habitats as synonymous with the biome system (p. 540, 578, 616), but this is only partly true. He has listed a series of plant associations, plant formations, and physical habitats and then attempted to show how the distribution of animal species fitted into these plant communities. The biome system is also divisible into predominantly animal communities (Ecology, 29: 101-114, 1948) which are of more interest to the zoologist. Animal communities do not ordinarily correlate with plant communities determined by the species of the plant dominants involved, but they do correlate with types of vegetation. The affinities in bird composition between different plant communities brought out on page 578 well illustrate this point, for these different plant communities produce only different faciations of the same animal communities.

In an analysis of the data along another line, emphasis is placed on the recognition of faunal groups rather than biotic provinces. A faunal group is an aggregation of species having similar climatic and biotic tolerances, ranges, and places of origin. Each faunal group may be found in more than one life zone and in several plant communities. The present bird composition of California is composed of four such avifaunas. The boreal, Great Basin, and Sonoran avifaunas invaded the state mostly from the north or from boreal environments, from the east, and from the southeast, respectively. The California avifauna is largely endemic west of the main mountain axis. Only after these faunas are recognized and their relative prevalence in different parts of the state determined, is the state divided and mapped into faunal provinces, districts, and areas to show different degrees of differentiation. The geological history of the different avifaunas is discussed, especially as it bears on the evolution of new forms. This evolution is related to climate, and the interesting point is made (pp. 613-614) that "in a more restricted area such as California, and particularly in an area along a coastline, the hydrogradient is conspicuous and rather fully overshadows the effect of the temperature gradient except for the sharp temperature effects associated with mountain systems."

The author's stress on characterizing areas in terms of prevailing avifaunas is a different approach than the use of biotic provinces. Biotic provinces are intended

to reflect current distribution and centers of taxonomic differentiation, regardless of past histories of the faunas involved. Characterizing areas in terms of avifaunas is well worthwhile but requires a much larger body of factual information, as otherwise there will be considerable conjecturing about past origins and invasions and the analysis will not be entirely objective in its procedure.

This paper represents a job well done, especially in view of the great diversity of terrain and complexity of bird populations that are involved. The paper is of unusual interest in the way it brings out the relative merits and distinctiveness of three different distributional systems. The student of animal distribution will find a challenge here to try to do something similar for his own region.—S. CHARLES KENDEIGH.

A Guide to Bird Songs. (Rev. ed.) Aretas A. Saunders. (Doubleday Co., Garden City), xiv + 307 pp., 201 figs., 1951. \$3.00.—The first edition of this book (reviewed in *'The Auk,'* 52: 205, 1935) has long been out of print. The present edition is a reprint of the original without revision, but with the addition of songs or calls of 37 species. Many bird students have received valuable aid from the first edition of this book, though others who would also like to be able to recognize bird songs have profited little or nothing from it. I believe the latter may be classed in two categories: those whose native musical talent is so slight as to preclude them from learning bird songs by any means whatsoever; and those with sufficient musical ability, but with the handicap of hoping perpetually to find "an easier way." Most of those in the latter group rationalize their evasion of the effort necessary to learn bird songs by claiming to be in the former category—lacking in talent, hence needing a very simple method of learning. What they do not know is that there is no easy way to learn bird songs, but that once thoroughly learned, identifications that formerly seemed impossible become easy. Not knowing this, and contrasting their own confusion with the expertness they see in those with long or intensive experience, they find no similarity in results and mistakenly conclude that there is no similarity in potential ability.

It is my present conviction, however, that anyone who can understand human speech, carry a tune fairly well after hearing it many times, and distinguish a human voice tone from a whistle can increase greatly his ability to identify bird songs by studying this book systematically for a few hours—not haphazardly for a few minutes, however. If he has made some effort to learn bird sounds in the field, I would venture to predict that several hours spent studying Saunders's book will profit him more than an equal number of hours trying to learn the songs from nature.

Mr. Saunders's system of notation is explained simply and clearly in a 15-page introductory chapter which must of course be read carefully before referring to the main text.

In anything so far advanced beyond the efforts of his predecessors as Mr. Saunders's system and his application of it, it is perhaps to be expected that his contemporaries might find what they consider to be minor defects in the system and occasional errors in its application. A few might be mentioned. Slurring in bird sounds, for example, is much more common than the graphs indicate and has considerable importance for identification. Also, the system of phonetics used contains some sounds which to my ear are not always approximated by the birds' voices; I cannot, for example, interpret the Greater Yellow-legs as saying in its flight call, 'wēē hī hāy' and 'wī hī hā hāy.' In a few of the songs, certain notes whose prominence results only from loudness or a more prominent position, such as at the beginning or end of a series, have been indicated in the graphs by longer horizontal lines, which are supposed to repre-

sent greater durations of time. Examples of this error may be found in the graphs of the songs of the Bay-breasted Warbler and in the grouped notes of the Black-billed Cuckoo and White-throated Sparrow. Each note in these groups should be shown to have about the same time value. Sometimes staccato or short notes are shown by such relatively long horizontal lines as to require the interpretation that they are legato or sustained (as in the flight calls of the Greater Yellow-legs). Diagnostic "grace" notes are sometimes omitted (as in graphs for the Indigo Bunting and Broad-winged Hawk).

The pitches of some of the songs are incorrect, as follows: the Crow and Fish Crow in reality call two octaves higher than indicated; the Mourning Dove, Barred Owl, Phoebe, the Black-capped Chickadee's '*Chickadee-dee-dee*' call, the first Redstart song, Red-tailed Hawk, Red-shouldered Hawk, Least Sandpiper, Semipalmated Sandpiper, Chuck-will's-widow, and Summer Tanager all sing or call one octave higher than indicated; and the Bay-breasted Warbler and Black-poll Warbler sing half an octave to an octave lower than is shown.

In some 20 or 30 of the accounts of species the choice of "typical" or common songs leaves much to be desired, as compared to the high standard set by the great majority of the accounts.

The key to bird songs is of unusual interest; it is perhaps of greater value for study as a systematic classification of bird songs than for use in attempting to "run down" any particular unknown song for the purpose of identifying it.

It will come as a shock to the reader with taxonomic bent that in the 1951 edition no changes have been made from the nomenclature of the 1935 edition. The newly added material, however, is mostly up-to-date.

The foregoing criticisms are minor as compared with the praise this book and its author deserve. It is by far the most satisfactory single source of written information on the identification of bird songs of the northeastern United States, and its contents should become familiar to every ambitious field student of bird identification.—
HAROLD H. AXTELL.

Fleas, Flukes, and Cuckoos. Miriam Rothschild and Theresa Clay. (Collins, London), pp. xiv + 304, 40 pls., 4 maps, 22 drawings, 1952. Price, 21s net.—The authors of this volume have performed an especial service through bringing more complete integration between the materials of two specialized aspects of zoology. Few ornithologists have an adequate understanding of the direct influence of parasites on birds and even fewer have appreciated the intimate correlation between evolution of birds and their parasites. Conversely, to many parasitologists birds are but incidental containers to hold parasites. Through a profound understanding of all sides of the problems of ecological and evolutionary relationships, Miss Rothschild and Miss Clay have brought together a wealth of interesting material in a well rounded treatment for students on both sides of the fence.

A rare literary leavening of frequent, undocumented quotations adds zest for the reader. The authors' powers of graphic description, narration, and unclouded definition join with homely comparisons to elevate the writing far above the usual textbook style. The numerous photographs, drawings, and micro-photographs add to the distinction of the volume.

It is impossible to actually "review" such a storehouse of facts, interpretations, and integrations, so only a few samples of characteristic findings will be presented here. The comparisons and contrasts between fleas (Aphaniptera) and feather lice (Mallophaga) of birds are especially well presented. Recalling the immediate professional interests of the two authors, this is not surprising. The origin of bird

fleas from those of mammals and the localization of bird lice on the host are particularly well presented, with especial emphasis upon the ecological adaptations between the lice and their hosts. The authors believe that the adaptations between birds and their lice probably have value in determining relationships of some of the hosts.

Taxonomists have commonly placed the ostriches and the rheas in separate orders in the belief that they are not closely related. As a reflection of relationship, the ostriches of Africa and the rheas of South America have closely related species of lice belonging to the same genus which occurs on no other birds. As another thought provoking problem of phylogeny, it is pointed out that flamingos harbor species of three genera of feather lice which occur elsewhere only on ducks, geese, and swans (Anseriformes) while the species of lice found on storks and herons (Ciconiiformes) never are found on either Anseriformes or on flamingos. This raises the question of whether phylogenetic relationships of the flamingos are more accurately traced through gross morphological likenesses or through the relationship of their parasites.

Throughout the text the varying degrees of host-parasite relationships and ecological interdependence are discussed in detail.—HARLEY J. VAN CLEAVE.

A Check-List of the Birds of Virginia. Joseph James Murray. (Virginia Soc. Ornith., Lexington, Va.), pp. 113, in wrappers, 1952. \$1.00.—Virginia is one of the fortunate states which include both seashore and mountains. Its bird students may observe in such varied habitats as coastal beaches and islands on the Eastern Shore, the sub-tropical Great Dismal Swamp, or the spruce-fir forests atop high Blue Ridge crests. To partake of these natural advantages, it has a strong and active bird group, the Virginia Society of Ornithology.

This check-list of Virginia birds is a cooperative venture of the Virginia Society, but its author and editor is Dr. J. J. Murray, generally recognized as the state's foremost bird authority. A founder of the Society, editor of its journal, 'The Raven,' and a long-time resident of the state, Dr. Murray has approached his task as scientist and pleasing writer. It is worth mentioning also that Dr. Murray has done notable missionary work in the ornithological field; most of the assistant ministers at his Lexington church have themselves become good bird students.

Included in the check-list are chapters on "Early Accounts of Virginia Birds," "Virginia Ornithology, 1800-1930," "The Virginia Society of Ornithology," "The Physical Features of Virginia," and "The Faunal Zones of Virginia." Like other workers in the Appalachians, Dr. Murray finds a modified life-zone concept more useful and meaningful in this region than is the newer biome concept. There is a valuable bibliography for the student of Virginia birds.

In the main body of the paper, 398 forms, plus two hybrids, are admitted as valid parts of the Virginia avifauna. In addition, there are 14 forms assigned hypothetical status. For each form treated there are concise notes on occurrence, breeding status, and distribution. As happens to other preparators of state lists, Dr. Murray is puzzled as to what to do with sight records. In these days of widespread travel and more concentrated observation, such records are bound to multiply. Dr. Murray has, very wisely as it appears to this reviewer, admitted certain unmistakable birds (the Brown Pelican as an example) on sight records only. In every case however he has followed a rule of admitting no bird which has not been seen by more than one competent observer, and on more than one occasion.

It is easy to obscure the value of such a work as this through petty criticisms. One could wish that proofreading had caught more of the typographical errors which are present. A map of the state, and an index, would have made the list more usable. Nevertheless, the present catalogue is a fine summarization of our present

knowledge of Virginia's avifauna. Dr. Murray and the Virginia Society of Ornithology are to be congratulated on its preparation and publication.

This reviewer trusts he may interject some of his own ideas as to the confusion in vernacular names without unduly reflecting on the Virginia check-list. In almost every new publication which appears we are witnessing some attempts to revise or displace common names which have had wide acceptance and long use. It is time, I believe, that we take a long look at the purpose of vernacular names.

In the more academic days of the science, ornithologists scorned common names, leaving them to the lay public. With the vast spread in bird interest, however, this country's ornithologists have taken to using common names in scientific meetings and including them in technical publications. This is as it should be, since the non-technical bird enthusiast can read journals and attend meetings with a reasonably good idea of what the scientist is talking about. The practice has improved communication and has helped to bridge the gulf between professionals and their much more numerous amateur brethren.

Recently, however, new, and widely varying, vernacular names are appearing in almost every new publication. Unless these names are quickly standardized, the reading public is going to be hopelessly confused. There is every reason to revise confusing names that have been applied to races, and this practice will have quick and enthusiastic reception, once it is understood. The Virginia check-list introduces many such changes, and with most of them I have no quarrel, although I must confess that "Mealy Common Redpoll" has a strange sound to my ear. Even this list is not consistent, however, since "Newfoundland Crossbill" and "Sitka Crossbill" are used without any reference (save in the scientific names) to the fact that these are races of the Red Crossbill.

Another tendency in nomenclature, which seems to me to have much less justification, is the attempt to make American vernacular names conform to those in use in England. If we stop to think about it, we all recognize that American and English common names (as is true in a larger sense of the variants in speech in the United States and Great Britain) have had parallel, rather than identical, developments. The name "Robin" in Great Britain means one bird; in the United States an entirely different one. But if the present tendency continues, we may expect that someone on this side of the Atlantic will propose seriously that we remove possible confusion by calling our familiar bird the American Rufous-breasted Thrush!

I doubt that the name "Hudsonian Whimbrel" will replace "Hudsonian Curlew" in this country, and I doubt the wisdom of introducing such a change. "Whimbrel" is a fine and meaningful name on misty English moors; it loses its connotations on a Virginia beach. As a good Anglophile, I still believe there is a place for our own names and usages.—MAURICE BROOKS.

American Wildlife and Plants.—Alexander C. Martin, Herbert S. Zim, and Arnold L. Nelson. (McGraw-Hill Book Co., Inc., New York), ix + 1-500, many drawings, maps, and graphs (unnumbered), 1951. \$7.50.—Following four introductory chapters (The Plant Roots of Wildlife, Farm Crops and Wildlife, Wildlife Food-habits Studies, and Interpreting the Data of this Book) the two major parts of this book are "Animals and Their Food" and "Plants Useful to Wildlife." In the first of these, birds are treated on 173 pages, mammals on 60, and fish, amphibians, and reptiles on 6. Data are presented graphically and clearly; most species accounts contain maps showing the breeding and wintering ranges within the United States, graphs showing the relative amounts of animal and vegetable food taken through the year, lists of plants used with relative importance and seasonal occur-

rence, and short sections on general habits and animal food. For species with wide ranges, separate lists of food items taken in different parts of the country are given; and for the Brant, the data are divided temporally to show the difference in food habits caused by the depletion of eel grass on the east coast about 1931. The order of species is more or less taxonomic (the Coot is listed among the waterfowl and the squirrels are divided among the "fur and game mammals" and the "small mammals"). The few references included are listed at the ends of species accounts.

In the section on plants useful to wildlife, most of the accounts are by genera with usually no species differences mentioned. The accounts include: distribution maps of the genera within the United States; short sections on habit, habitat, and usefulness; and lists of animals utilizing the plants. The lists are arranged to show the parts of the plants eaten, the geographic areas where they are used, and the extent of use.

The authors' aim was to make available in a form acceptable to diverse groups the vast amount of information on the use of plants as food for animals in this country. In doing so, they have based their work on the extensive files of the U. S. Fish and Wildlife Service and on studies made by state and local groups; their survey of the literature, however, has been far from complete. Wildlife technicians, sportsmen, naturalists, and home-owners who want to know what to plant in order to attract birds will all find this volume a storehouse of valuable information; the more serious student will still have to make his own search of the literature and examination of the original records from which this book was compiled.

It is unfortunate that more care could not have been taken in the details of preparation. The citation for Mrs. Nice's monograph on the Song Sparrow is incomplete and incorrect, and a figure of the Mantled Ground Squirrel illustrates the Western Chipmunk; one wonders if there may not be similar errors in food habits material.

A minor criticism is that this reviewer finds such words as Douglasfir, beeplants, burreeeds, spikerushes, and dropseedgrasses less easy to read than if hyphenated or not compounded; and further, the authors have not been consistent in their policy of compounding words, for we find mountainlaurel with mountain-mahoganies, wildcarrot, wildprivet, and wildbarleys with wild roses, wild cherries, and wild geraniums.

The small black and white illustrations of animals by Walter A. Weber and plants by John W. Brainerd are almost without exception excellent and the other illustrative material is of generally high caliber throughout. On the whole, the authors have succeeded well in presenting this mass of factual material in an attractive and useful manner to the audience for which it was intended.—ROBERT W. STORER.

The Bird: Its Life and Structure. Gertrud Hess. (translated from the German by Phyllis Barclay-Smith). (Herbert Jenkins Ltd., London), pp. ix + 15-244, 188 figs., tables, 1951.—In the foreword the author notes that, "... a general ornithology is given, which sums up and concentrates on what applies to all species." She has, I believe, accomplished the desired goal of presenting a "primer textbook" of ornithology. The professional ornithologist will at first be disturbed by the broad generalizations and by the perhaps slight attention paid to certain physiological aspects, but the aim of the author must be remembered.

For the beginner and for the amateur who wishes to extend a bit his horizons of information, the book is satisfactory and desirable. Additional material on the ecology and distribution of birds would have rounded out the scope of the presentation. In places where factual information is given it would have been less confusing, and

more accurate, to have given the full name of a bird rather than simply saying swift, hawk, sparrow, and duck. Examples used are chiefly of European birds, and the classification is that of Stresemann.—HARVEY I. FISHER.

Check-List of North American Birds North of the Mexican Border. J. E. Keays. (London Typesetting Co., London, Ontario, Canada), pp. 1-38, 1952. \$1.50. —The title page of this pamphlet notes "Condensed from the check-list of North American birds, fourth edition 1931. Being the official list of the American Ornithologists' Union." Lest any misunderstanding arise from this statement, it should be stated that this present list is not an "official list" of the A.O.U. which had nothing to do with its preparation.

The only information given is A.O.U. number and common and scientific names. Mr. Keays, the condenser and compiler, has used the A.O.U. numbers for the forms but has not incorporated the changes in status and nomenclature, or the additional forms, included in the various supplements published by the Check-list Committee of the A.O.U. The sequence has been modified to list the *numbers* consecutively, perhaps for ease in reference to them, but this does violence to the present "phylogenetic sequence." Further, families recognized in the 1931 A.O.U. list are indiscriminately mixed and confused. *Phalacrocorax* is listed as the *family* for the cormorants! Subfamily names are given as family names for spoonbills, ibises, and cranes! The family Falconidae is omitted. Many names are misspelled.

It is unfortunate that this list was published. It is inaccurate and out of date by 20 years.—HARVEY I. FISHER.

ALLEN, FRANCIS H. 1952. The song of the Alder Flycatcher. Wilson Bull., 64 (2): 107-109, 1 fig.—Of *Empidonax traillii traillii*, with comments on the description of bird songs.

ALLEN, ROBERT W., AND MARGARET M. NICE. 1952. A study of the breeding biology of the Purple Martin (*Progne subis*). Amer. Midl. Nat., 47 (3): 606-665, 9 figs., 12 tables.

ARMSTRONG, EDWARD A. 1952. The distraction displays of the Little Ringed Plover and territorial competition with the Ringed Plover. Brit. Birds, 45 (2): 55-59.—Altercations between pairs of *Charadrius dubius* and *C. hiaticula*.

ARNOLD, G. A., AND M. A. ARNOLD. 1952. The nesting of a pair of Blue Tits. Brit. Birds, 45 (5): 175-180.—A pair of color-banded *Parus caeruleus* was watched in a garden in Warwickshire. The average of 58 periods spent by the female on the nest while incubating was 59 minutes; the average of 81 periods off the nest was 7.5 minutes. Of 12 eggs laid, 10 hatched and 9 young were fledged. The female disappeared when the young were 11 days old; for 5 days the male fed as often as the two parents had done, bringing between 550 and 600 meals per day. On the 18th and 19th days his rate of feeding dropped markedly. During the afternoon of the last day he called the young out despite an impending storm and most of the fledglings must have perished that night.—Margaret M. Nice.

BAILEY, ROBERT E. 1952. The incubation patch of passerine birds. Condor, 54 (3): 121-136, 4 figs.—A field and laboratory study of the macroscopic and microscopic structure of the incubation patch in passerine birds representing 12 families. All have a single large patch located in and coincident in size with the ventral apterium. Formation of the structure involves four stages correlated with the phases of the nesting cycle, namely, the defeathering, vascularization, edematous and recovery stages. The incubation patch was produced in non-breeding birds by continuous treatment with the reproductive hormone estro-

- diol. If the birds were hypophysectomized, estradiol produced only vascularity, whereas if both estradiol and prolactin were administered, a complete patch developed. Neither prolactin nor testosterone alone, or in combination with other hormones, had any effect.—W. H. Behle.
- BALDINI, JAMES T., ROY E. ROBERTS, AND CHARLES M. KIRKPATRICK. 1952. Studies of the reproductive cycle of the Bobwhite Quail. *Journ. Wildl. Manag.*, **16** (1): 91-93.—Under continuous light, *Colinus virginianus* may attain sexual maturity at 139 days of age, may be polygamous, and may be made available at any age for research purposes throughout the year.
- BANNERMAN, DAVID, AND JANE PRIESTLEY. 1952. An ornithological journey in Morocco in 1951. *Ibis*, **94** (3): 406-433, map. (To be concluded.)
- BARTSCH, PAUL. 1952. A note on the first bird-banding in America. *Bird-Banding*, **23** (2): 59-60.—In 1902 the author banded 23 young Black-crowned Night Herons, *Nycticorax nycticorax hoactli*, near Washington, D. C.; in 1903, 78 were banded, and in 1910, 367. The bands were inscribed "Return to Smithsonian Institution" with the year and a serial number. From the first banding there was one return, from the second, 4 returns; from the third 12 returns, the most distant being: Sept. 17, 1910, Toronto; Dec. 7, 1910, St. Simons Island, Ga.; April, 1911, Cuba.
- BRECHER, WILLIAM J. 1952. The role of vision in the alighting of birds. *Science*, **115** (2996): 607, 608.—Birds flown blind-folded seemed to alight without regard to either wind velocity or direction. The author interprets the data obtained as indicating that birds alight by visual cues.
- BEHLE, W. H., AND R. K. SELANDER. 1952. New and additional records of Utah birds. *Wilson Bull.*, **64** (1): 26-32.—An annotated list of 36 species and subspecies.
- BERGER, ANDREW J. 1952. The comparative functional morphology of the pelvic appendage in three genera of Cuculidae. *Amer. Midl. Nat.*, **47** (3): 513-605, 7 tables, 4 charts, 29 pls.—An excellent study of variations in the muscles and bones, and their functional significance. The information is also applied to taxonomy where possible. (*Coccyzus*, *Crotophaga* *Geococcyx*.)
- BERGER, A. J., AND D. F. PARMELEE. 1952. The Alder Flycatcher in Washtenaw County, Michigan; breeding distribution and Cowbird parasitism. *Wilson Bull.*, **64** (1): 33-38, 1 fig., 1 table.—Descriptions of the nesting habitat and nest location of *Empidonax traillii* and notes on Cowbird parasitism.
- BERGSTROM, E. ALEXANDER. 1952. Extreme old age in terns. *Bird-Banding*, **23** (2): 72, 73.—A banded Arctic Tern, *Sterna paradisea*, in Germany, killed at the age of 27 years. In North America a Caspian Tern, *Hydroprogne caspia imperator*, was "taken for a scientific specimen" at the age of 26 years. A Least Tern, *Sterna antillarum*, found dead, aged 21 years, at Cotuit, Mass. A Herring Gull, *Larus argentatus*, in Germany, reached almost 26 years.
- BOLDT, WILBUR, AND GEORGE O. HENDRICKSON. 1952. Mourning Dove production in North Dakota shelterbelts, 1950. *Journ. Wildl. Manag.*, **16** (2): 187-191.—About four pairs of *Zenaidura macroura* nested in each mile of five shelter belts studied (about one pair per three acres of shelter belt). A mean breeding population of 39 doves increased 162 per cent (in line with a Texas age ratio reported by Swank). Preferred nesting trees were Chinese elm, American elm, and Russian olive.—J. J. Hickey.
- BRACKBILL, HERVEY. 1952. Birds becoming "caught" in flocks of other species. *Wilson Bull.*, **64** (1): 44.—Small numbers of birds of one species have joined or

- been attracted into flocks of other species where they behaved as members of the flock.
- BRAUNER, JOSEPH. 1952. Reactions of Poor-wills to light and temperature. *Condor*, **54** (3): 152-159, 4 figs.—The onset and cessation of Poor-will activity at dusk and dawn coincides with a light intensity usually lower than one foot-candle. The limited duration of activity is related in length to phases of the moon and to weather. Cloacal temperatures of active Poor-wills range from 40.6° to 43.1° C. There is control of body temperatures at low environmental temperatures. Differences were noted between daily temperature curves of Poor-wills and nocturnal and diurnal birds. Several experiments with a captive bird failed to induce torpidity. A method of cooling by vibrating the throat is suggested. Poor-will chicks demonstrate semi-poikilothermy.—W. H. Behle.
- BRODKORB, PIERCE. 1952. The types of Lambrecht's fossil bird genera. *Condor*, **54** (3): 174, 175.—A listing of the types of 28 new genera erected by Lambrecht which were omitted from his "Handbuch der Palaeornithologie" (1933).
- BRODKORB, PIERCE. 1952. A new rail from the Pleistocene of Florida. *Wilson Bull.*, **64** (2): 80-82, 1 fig.—*Laterallus guti* new sp. (Pleistocene, near Reddick, Marion Co., Fla.).
- BROEKHUYSEN, G. J., AND G. RUDEBECK. 1951. Notes on the Cape Gannet. *Ostrich*, **22** (3): 132-138.—Observations on the Cape Gannet, *Morus capensis*. Five photographs.
- BURLHIGH, T. D., AND A. J. DUVALL. 1952. A new Ovenbird from the southeastern United States. *Wilson Bull.*, **64** (1): 39-42.—*Seiurus aurocapillus canivirens* new subsp. (Margret, Fannin County, Georgia). In addition, comments are made on other races of the species.
- CAMPBELL, W. D. 1952. Some observations on quail during the breeding season of 1951. *Brit. Birds*, **45** (5): 167-170.—In mid-June a small concentration of *Coturnix coturnix* bred in Berkshire. By the use of a call-pipe, observations were made on the calls of male and female.
- CARLETON, GEOFFREY. 1951. Warbler dates for Central Park. *Proc. Linn. Soc., N. Y.*, Nos. 58-62: 73-74.
- CHAPIN, JAMES P. 1952. *Campethera cailliautii* and *permista* are conspecific. *Ibis*, **94** (3): 535, 536.
- CHISHOLM, A. H. 1952. Bird-insect nesting associations in Australia. *Ibis*, **94** (3): 395-405.
- CLANCEY, P. A. 1951. Notes on birds of the South African subcontinent. *Ann. Natal Mus.*, **12** (1): 137-151, 2 pls.—Great Spotted Eagle, *Aquila clanga*, recorded from Natal; the Mountain Buzzard, *Buteo oreophilus*, recorded from Natal; the South African population of the Great Spotted Cuckoo described as new, *Clamator glandarius choragium* (Hobane, northern Natal); critical notes on the South African record of the Wheatear, *Oenanthe oenanthe*; a new race of pipit described from Zimbite, near Beira, Portuguese East Africa—*Anthus richardi spurium*; and notes on *Macronyx capensis colletti*, *Lamprocolius nitens*, *Ploceus ocularis*, *Coliuspasser ardens*, and *Granatina granatina*.
- CLANCEY, P. A. 1951. A new race of the Half-collared Kingfisher. *Ostrich*, **22** (3): 176-178.—*Alcedo semitorquata tephria*, new subspecies from Zimbite, near Beira, Portuguese East Africa.
- CLANCEY, P. A. 1952. A systematic account of the birds collected on the Natal Museum Expedition in the Lebombo Mountains and Tongaland, July, 1951. *Ann. Natal Mus.*, **12** (2): 227-274.—An annotated report on a collection of over

500 specimens obtained in a three weeks' survey of the little worked mountainous area of northeastern Zululand, where that country borders on Swaziland. Eight new races of birds are proposed, as follows: *Halcyon albiventris vociferans*, *Pogoniulus pusillus nielhameri*, *Pogoniulus bilineatus riparium*, *Andropadus irripertus mentor*, *Thamnolaea cinnamomeiventris antiochthones*, *Camaroptera brachyura constans*, *Batis capensis hollidayi*, and *Anthus leucophrys enunciator*. In addition there are many critical comments on other forms, and much of interest relating to the distribution and characters of other birds.

CLANCEY, P. A. 1952. Miscellaneous taxonomic notes on African birds. Durban Mus. Novit., 4 (1): 1-19. 2 figs.—*Prodotiscus regulus adustoides* (Pietermaritzburg, Natal, South Africa), *Jynx ruficollis striaticula* (Garstfontein, Pretoria, Transvaal), *Monticola explorator tenebriformis* (Ingwavuma, Lebombo Mts., NE Zululand), *Cossypha natalensis hylophona* (Chintech, Nyasaland).

CLANCEY, P. A. 1952. Geographical variation in the Ground Woodpecker *Geocolaptes olivaceus* (Gmelin), a unique South African avian endemism. Journ. Sci. Soc. Univ. Natal., 8: 3-8, 4 figs.—*Geocolaptes o. prometheus* (Woodbush, Zoutpansberg, northern Transvaal), *G. o. petrobates* (Malavaneng Valley, Maluti Mts., Basutoland), new subspecies.

CLANCEY, P. A., AND C. S. HOLLIDAY. 1951. South African races of the Redwing Starling. Ostrich, 22 (3): 190, 191.

CLARK, D. T. 1952. Three new dilepidid cestodes, *Dictymetra numenii* n. gen. n. sp.; *Dictymetra paranumenii* n. sp. and *Anomolaenia filovata* n. sp. Proc. Helm. Soc. Wash., 19 (1): 18-27.—From Nebraska shore birds.

COHEN, EDWIN, AND BRUCE CAMPBELL. 1952. Nestboxes. British Trust Ornith., Field Guide No. 3: 1-32, 22 figs.—Types and designs of boxes successfully used in the British Isles.

CUTHBERTSON, E. I., G. T. FOGGITT, AND M. A. BELL. 1952. A census of common sandpipers in the Sedbergh area, 1951. Brit. Birds, 45 (5): 171-175.—Thirty nests of *Actitis hypoleuca* were found along 14 miles of the river Lune and its tributaries from 1937 to 1951; in 24 of these the eggs hatched.

DALE, FRED H. 1952. Sex ratios in pheasant research and management. Journ. Wildl. Manag., 16 (2): 156-163.—Sex ratios must be used in converting crowing-cock indices into population estimates, in interpreting hunting season kill as population estimates, in indexing production, and in interpreting age ratios as indices of productivity. The ratio of observed to actual sex ratio varies with the season and with methods of observation. Intensive studies on the technique of observing sex ratios are a major need in research on *Phasianus colchicus*.—J. J. Hickey.

DEED, ROBERT F. 1952. Notes on the northward movement of certain species of birds into the Lower Hudson Valley. Proc. Linn. Soc. N. Y., Nos. 58-62: 63-66.—Tufted Titmouse (*Parus bicolor*), Cardinal (*Richmondia cardinalis*), and Turkey Vulture (*Cathartes aura*) have in the past 20 years become common in Rockland County, N. Y. Rapid increases in numbers have also been found for the Laughing Gull (*Larus atricilla*), Double-crested Cormorant (*Phalacrocorax auritus*), Little Blue Heron (*Florida caerulea*), American Egret (*Casmerodius albus*), and Snowy Egret (*Leucophoyx thula*).

DEIGNAN, H. G. 1952. The earliest name of the Korean Tree Sparrow. Condor, 54 (3): 171.—The type locality of *Passer montanus orientalis* Clark, 1910, is restricted to Pusan, South Kyongsang Province, Korea. *P. m. dybowskii* Domaniewski 1915 (Ussuriland and Korea) becomes its synonym.

DEL TORO, MIGUEL A. 1952. New records of birds from Chiapas, Mexico. Condor, 54 (2): 112-114.—Annotated list of 18 additional species.

- DEXTER, RALPH W. 1952. Chimney Swift returns at Kent, Ohio, 1951. *Bird-Banding*, **23** (2): 73, 74.—Forty-five *Chaetura pelagica* returned in 1951; they had been banded from 1946 to 1950.
- EISENMANN, EUGENE. 1952. Copulatory behavior in the Least Tern. *Proc. Linn. Soc. N. Y.*, Nos. 58-62: 71.—A male *Sterna albifrons* did not present fish to the female until copulation was effected.
- ELDER, W. H., AND C. M. KIRKPATRICK. 1952. Predator control in the light of recent wildlife management concepts. *Wilson Bull.*, **64** (2): 126-128.
- ELLIS, HAZEL R. 1952. Nesting behavior of a Purple-throated Fruit-crow. *Wilson Bull.*, **64** (2): 98-100.—Of *Querula purpurata* on Barro Colorado Island, Panama Canal Zone.
- ENGELS, WILLIAM L. 1952. Vertebrate fauna of North Carolina coastal islands. II. Shackleford Banks. *Amer. Midl. Nat.*, **47** (3): 702-742, 13 figs.—Breeding birds only, pp. 729-734.
- ERICKSON, JOHN G. 1952. Birds seen on a trip to Labrador. *Wilson Bull.*, **64** (2): 101-105, 1 table.—24 species observed along the coast in autumn.
- EVENDEN, FRED G., JR. 1952. Additional bird records for Nevada. *Condor*, **54** (3): 174.—Five species.
- EVENDEN, FRED G., JR. 1952. Notes on Mexican bird distribution. *Wilson Bull.*, **64** (2): 112, 113.
- FENNELL, CHESTER M. 1952. Some observations on the birds of southern Korea. *Condor*, **54** (2): 101-110.—Annotated list of 89 kinds, many represented by specimens.
- FISCHER, RICHARD B. 1952. Bird photography for bird banders. *Bird-Banding*, **23** (2): 63-72.
- FLEAY DAVID. 1952. With a Wedge-tailed Eagle at the nest. *Emu*, **52** (1): 1-16, 4 pls.—Notes on plumage, sex differences, voice, nesting, care of young, and development—all obtained from a captive female and two foster young she raised.
- FLEMING, C. A. 1952. On the specific name of the Little Shearwater. *Emu*, **52** (1): 17-23.—Urges suppression of the name *Procelaria munda* Kuhl, 1820, and adoption of *Puffinus assimilis elegans* Giglioli and Salvadori for subantarctic race of Little Shearwater.
- FOX, WADE. 1952. Behavioral and evolutionary significance of the abnormal growth of beaks of birds. *Condor*, **54** (3): 160-162, 2 figs.
- FRINGS, HUBERT, AND WILLIAM A. BOYD. 1952. Evidence for olfactory discrimination by the Bobwhite Quail. *Amer. Midl. Nat.*, **48** (1): 181-184.—Caged Bobwhite apparently discriminated between two feeders by smell, and developed a preference for one.
- GLEGG, W. E. 1952. [Obituary of]. *Ibis*, **94** (3): 524, 525; photo.
- GOODWIN, DEREK. 1952. Notes and display of the Magpie. *Brit. Birds*, **45** (4): 113-122.—Description of eight notes and eight displays, illustrated with sketches, of *Pica pica*, largely from birds in captivity.
- GRAUSTEIN, JEANETTE E. 1951. Nuttall's travels into the old Northwest. An unpublished 1810 diary. *Chronica Botanica*, **14** (1-2): vii + 88, 5 figs., 10 pls. (Available at the Chronica Botanica Co., Waltham, Mass., for \$3.00).—Following a brief account of Nuttall's life, the diary is printed with numerous explanatory notes by Graustein. Although statements concerning birds are few, it is possible to gain a word picture of many aspects of the frontier at this time, and on page 81 is an index to the birds mentioned.

- GRAUSTEIN, JEANETTE E. 1952. Audubon and Nuttall. *Sci. Monthly*, **74** (2): 84-90.—An account of the friendship existing between these two men. This friendship has been slighted in past accounts of each man.
- GREGORY, JOSEPH T. 1952. The jaws of the Cretaceous toothed birds. *Ichthyornis* and *Hesperornis*. *Condor*, **54** (2): 73-88.—Detailed descriptions and illustrations are given and comparisons made with *Gavia*, *Archaeornis*, *Alligator* and *Platycarpus* (a mosasaur). *Hesperornis* shows convergence toward the aquatic reptilian mosasaurs but possesses definite avian characteristics. The jaw of *Ichthyornis* agrees with mosasaurs in minute details, and it is concluded that the toothed jaws attributed to *Ichthyornis* are not those of a bird but belong to a small mosasaur.—W. H. Behle.
- GRIZZELL, ROY A., JR. 1952. Selectivity of the mirror traps. *Journ. Wildl. Manag.*, **16** (1): 114, 115.—A plain trap caught 11 birds and 48 mammals; a mirror trap 57 birds and 48 mammals; in Maryland. Cardinals (*Richmondia cardinalis*) made up 47 of the catch.—J. J. Hickey.
- GROSSENHEIDER, RICHARD P. 1952. Little Penguin. *Wilson Bull.*, **64** (2): 66-68, 1 plate.—A brief description of the nesting habits of *Eudyptula minor*.
- GULLION, GORDON W. 1952. Sex and age determination in the American Coot. *Journ. Wildl. Manag.*, **16** (2): 191-197.—*Fulica americana* can be accurately sexed by voice, as is the case with *F. atra*. Only 86 per cent can be sexed by means of tarsal measurements. Legs of green, yellow-green, and yellow, respectively, denote birds in their first, second, and third or later years. The bursa of Fabricius cannot be used to distinguish between first- and second-year birds. The sex ratio was nearly even (52 per cent males) in a sample of 123, and ages were distributed 100 to 24 to 10 or 12 for the three groups mentioned above.—J. J. Hickey.
- GULLION, GORDON W. 1952. The displays and calls of the American Coot [*Fulica americana*]. *Wilson Bull.*, **64** (2): 83-97, 2 figs.
- HAUGEN, ARNOLD O. 1952. Trichomoniasis in Alabama Mourning Doves. *Journ. Wildl. Manag.*, **16** (2): 164-169.—*Zenaidura macroura* underwent a significant decrease in numbers in Alabama in 1950 due to *Trichomonas gallinae*, especially in June-August. Extreme loss of weight and failure to raise young were noted. This outbreak occurred close to the point where immense flocks of *Ectopistes migratorius* disappeared after the fall of 1881. In wondering if this disease was responsible for "the rapid disappearance" of the Passenger Pigeon, Haugen overlooks the fact that the continental population of pigeons declined rather gradually, and that big flights of this species were always locally erratic. That the pigeon died out from overshooting and overnetting is quite evident from a monographic study by A. W. Schorger which is still in manuscript. As the late Charles A. Urner once put it: no species laying a small clutch of eggs and migrating in dense flocks over long distances can long withstand the pressure of modern gunning. This is as true of shorebirds today as it was of Passenger Pigeons 75 years ago.—J. J. Hickey.
- HAVERSCHMIDT, FR. 1952. Notes on the life history of *Amazilia fimbriata* in Surinam. *Wilson Bull.*, **64** (2): 69-79, 2 figs., 3 tables.—Observations on the nesting and other habits of this hummingbird.
- HICKEY, JOSEPH J. 1951. Occurrence of European Teal on Long Island. *Proc. Linn. Soc. N. Y.*, Nos. **58-62**: 70-71.—Records of the frequent occurrence of *Anas crecca* began about the time this species was being sold to local aviarists; but the European Teals seen on Long Island seem to be fully migratory.

- HICKEY, JOSEPH J. 1952. Monthly distributions of Mallard hunting mortality. *Journ. Wildl. Manag.*, **16** (1): 32-38.—Regional, annual, and age differences are evident in the chronology of the kill. These would appear to be objective criteria in determining how weather modifies the effect of a given set of hunting regulations.
- HOPKINS, C. A., AND J. D. SMYTH. 1951. Notes on the morphology and life history of *Schistocephalus solidus* (Cestoda: Diphyllbothriidae). *Parasitology*, **41** (4): 283-291.—This tapeworm becomes almost mature in the intermediate host (a Stickleback) and inhabits a fish-eating bird for only 36 hours.
- HOWELL, THOMAS R., AND GEORGE A. BARTHOLOMEW, JR. 1952. Experiments on the mating behavior of the Brewer Blackbird. *Condor*, **54** (3): 140-151, 4 figs.—Stuffed specimens of both sexes of *Euphagus cyanocephalus* were placed on the ground in the open near concentrations of the species on the U. C. L. A. campus, Los Angeles, California, from March 24 to June 2, 1951. The dummies were modified by the deletion and substitution of parts and by changes in posture. Results indicated that mating behavior depends not on one major factor but on combinations of such elements as form, posture, and color. To obtain a mating response from a male, wings on the dummy are not necessary. Either a head or a tail must be present, but one or the other may be removed without eliminating the response. If the tail is present, it should be at an angle above horizontal. Eye color is not important. Plumage color should be predominantly that of a female. Since the dummy is silent, no vocal response from a female is necessary to evoke the mating reaction of the male, nor is movement of the female necessary.—W. H. Behle.
- HULSBOS, KLAAS. 1952. A camera hunt for the Purple Heron [*Ardea purpurea*]. *Nat. Hist.*, **61** (5): 208-211, 240, 6 photos.
- HUTT, F. B. 1951. Snow-white down in the chick. *Journ. Heredity*, **42** (3): 117-120.
- HUTT, F. B. 1952. Lethal action of the gene for extension of black pigment in the fowl. *Genetics*, **36**: 213-234.
- INGALLS, ALBERT G. 1952. The amateur scientist. *Sci. American*, **186** (5): 86-88.—Popular account of the banding operations of John A. and Mabel Gillespie of Glen Olden, Pa.
- JOBIN, LEO. 1952. Some bird records from the Cariboo District, British Columbia. *Condor*, **54** (3): 171, 172.
- JOHRI, L. N. 1951. On avian cestodes of the family Dilepididae Fuhrmann 1907, collected in Burma. *Parasitology*, **41** (1): 11-14.—Two new species of *Eugonodacum* (from a plover and an eagle) are described and two species of *Dilepis* are redescribed (from a snipe and a heron).
- JOLLIE, MALCOLM. 1952. Comments on the check-list of the birds of Idaho. *Condor*, **54** (3): 172, 173.—Inadequacies and corrections of the Arvey list (Univ. Kansas Publ., Mus. Nat. Hist., 1, 1947: 193-216) noted.
- JORDAN, JAMES S., AND FRANK C. BELLROSE. 1951. Lead poisoning in wild waterfowl. *Illinois Nat. Hist. Surv. Biol. Notes*, No. **26**: 1-27, 18 figs.—This constitutes a preliminary report of the results obtained through a cooperative study. Lead poisoning, as studied here, results only from the presence of lead in the digestive tract. Breakdown of the lead pellets and formation of various lead compounds damages the liver, kidneys, and muscles of the digestive tract. The symptomology, occurrence, mortality, and influence of diet on this poisoning are discussed on the basis of field and experimental observations. Some suggestions are made as to ways of alleviating the effects.

- KAGAN, I. G. 1952. Further contributions to the life history of *Neoleucochloridium problematicum* (Magath, 1920) new comb. (Trematoda: Brachylaemidae). Trans. Amer. Micro. Soc., 71 (1): 20-44.—Biology in the intermediate host, a snail; final hosts are gallinules and rails.
- KELSO, LEON. 1952. Some fundamentals of the feather. Biol. Leaflet, No. 58: 1-8.—This brief review of some chemical and physical phenomena suggested as occurring on and in the feathers of birds is very thought-provoking. It points up the meager information available on these matters and should be a stimulus for detailed, controlled investigations.
- KELSO, LEON. 1952. Gas conversion by the feather. Biol. Leaflet No. 58A: 1.
- KIMBALL, JAMES W. 1951. Game conservation and ecology. Sci. Monthly, 73 (6): 353-355.—Comments on the need for better basic ecological knowledge in waterfowl management.
- KIRKPATRICK, CHARLES M., DONALD E. STULKEEN, AND JAMES T. BALDINI. 1952. Effect of simulated gunshot injuries on reproduction of game farm Bobwhites. Journ. Wildl. Manag., 16 (1): 54-58.—Nonlethal gunshot wounds did not affect onset of laying, clutch size, fertility, or hatchability in *Colinus virginianus*.
- KOZICKY, EDWARD L., AND HENRY G. WESTON, JR. 1952. A marking technique for Ring-necked Pheasants. Journ. Wildl. Manag., 16 (2): 223.—Tails of *Phasianus colchicus* were shortened by scissors, given a coat of DuPont Duco Household Cement, and then painted. These were subsequently distinguishable up to 400 yards.
- LAUGHLIN, ROBERT M. 1952. A nesting of the Double-toothed Kite in Panama. Condor, 54 (3): 137-139.—Observations made at Barro Colorado Island, Panama, in June, 1951, of an unsuccessful nesting of *Harpagus bidentatus*.
- LAWRENCE, C. C. 1952. Notes on the Golden Whistler (*Pachycephala pectoralis*) in Tasmania. Emu, 52 (1): 25-31, 2 pls.—Natural history notes.
- LEVI, HERBERT W. 1952. Evaluation of wildlife importations. Sci. Monthly, 74 (6): 315-322.—A criticism of stocking policies for exotics.
- LEVINE, N. D., P. D. BEAMER, AND E. MCNEIL. 1952. *Hexamita* (Protozoa: Mastigophora) from the Golden Pheasant. Journ. Parasit., 38 (1): 90.—Pathogenic.
- LOVELL, HARVEY B. 1952. Black Vulture depredations at Kentucky Woodlands. Wilson Bull., 64 (1): 48, 49.—*Coragyps atratus* killing young pigs.
- LUNK, WILLIAM A. 1952. Notes on variation in the Carolina Chickadee. Wilson Bull., 64 (1): 7-21, 4 figs., 2 tables.—From a study of *Parus carolinensis* over its entire range were found a cline of increasing size from south to north and one of increasing brownness from east to west. The known range of the species is extended to the northwest. Detailed measurements are given and comparisons are made with *P. atricapillus*. A new race is described, *P. c. atricapilloides* (Arnett, Ellis Co., Oklahoma).—J. T. Tanner.
- MANUEL, CANUTO G., AND E. THOMAS GILLIARD. 1952. Undescribed and newly recorded Philippine birds. Amer. Mus. Novit., No. 1545: 1-9, 4 tables.—*Accipiter trivirgatus castroi* (Anibawan, Polillo), *Otus bakkamoena batanensis* (Basco, Batan Island), new subspecies. *Dicaeum rubricapilla* (Mt. Kampalili; Davao, Mindanao) new species.
- MARLER, P. 1952. Variation in the song of the Chaffinch, *Fringilla coelebs*. Ibis, 94 (3): 458-472, 2 figs., 6 tables.
- MAYR, E. 1952. *Turdus musicus* Linnaeus. Ibis, 94 (3): 532-534.

- MEANLEY, BROOKE. 1952. Notes on the ecology of the Short-billed Marsh Wren in the Lower Arkansas rice fields. *Wilson Bull.*, **64** (1): 22-25.—Individuals of *Cistothorus platensis stellaris* appeared in the rice fields in July when the rice was tall enough to provide cover, and they nested there in August and into September. The environment, nesting density and effects on the nests of harvesting of the rice are described. These observations extend southward the known nesting range of this species.
- MEANLEY, BROOKE. 1952. Notes on nesting Traill's Flycatcher [*Empidonax traillii*] in eastern Arkansas. *Wilson Bull.*, **64** (2): 111-112.
- MILLER, A. W., AND RUSSELL HENRY. 1952. Mechanical aids for bird banding. *Calif. Fish and Game*, **38** (1): 43-51.—"Horseshoe-type" lock-ring pliers, telephone pliers, and slip-joint pliers were modified into a series of band spreaders and found to be very useful.
- MILLER, LOYE. 1952. Auditory recognition of predators. *Condor*, **54** (2): 89-92.—Detailed results of field experiments with birds whereby calls of owls of the genera *Bubo*, *Strix*, *Otus*, and *Glaucidium* were imitated. These indicate that the ear is of great importance in predator recognition by birds.—W. H. Behle.
- MILLER, LOYE. 1952. Songs of the Western Meadowlark [*Sturnella neglecta*]. *Wilson Bull.*, **64** (2): 106-107, 1 fig.
- MOHLER, LEVI L. 1952. Fall and winter habits of Prairie Chickens in southwest Nebraska. *Journ. Wildl. Manag.*, **16** (1): 9-23.—Flocks of *Tympanuchus cupido* increased in size during the fall and possessed home ranges of about 20,000 or more acres. Cornfields were used most (37 times) for feeding, sorghum shocks next (21), rye stubble (4), and sudan grass (4). Feeding periods lasted about 82 minutes. Dense native grasses were preferred roosting cover, night roosts being one-eighth to three-quarters mile from feeding places. Flushing distances increased from about 23 yards in September to 58 in December.—J. J. Hickey.
- MOREAU, R. E. 1952. Africa since the Mesozoic: with particular reference to certain biological problems. *Proc. Zool. Soc. London*, **121** (4): 869-913, 1 fig., 3 tables.—After critical review of the Tertiary geology and climate, the author finds no evidence for major change in the climate or fauna after the Miocene and believes the equator remained in its present position throughout the Tertiary. The avifaunas of the lowland evergreen, the montane evergreen, and the savanna are quite different and must have evolved in isolation from each other. The affinities of the bird life with the avifaunas of Europe and Asia are discussed.
- MURIE, OLAUS J. 1952. Additional records of *Cuculus* in North America. *Condor*, **54** (2): 114.—Two specimens, one from St. Lawrence Island, the other from Rat Island in the Aleutian Islands.
- MURPHY, ROBERT C. 1951. The impact of man upon nature in New Zealand. *Proc. Amer. Philos. Soc.*, **95** (6): 569-582, 21 figs.
- OLSEN, O. W. 1952. *Avioserpens bifidis*, a new species of nematode (Dracunculidae) from ducks. *Trans. Amer. Micro. Soc.*, **71** (2): 150-153.—Apparently pathogenic; in tongue of Barrow's Golden-eye.
- OSSOWSKI, L. L. J. 1952. The Hadedah Ibis, *Hagedashia hagedash hagedash* (Latham) and its relation to pest control in wattle plantations. *Annals Natal Mus.*, **12** (2): 279-290.—Results of a study of the nesting, roosting, and feeding habits of this ibis, frequently found in and near wattle groves, indicate that the species is definitely beneficial to the planter, as 71.7 % of the insects it eats are species said to be harmful to wattles, and a further 24.6 % could be classified as possibly harmful. The ibises are large birds and voracious feeders, and consume great quanti-

- ties of the pests. As many as 275 specimens of the latter were found in the alimentary tract of one ibis.
- PARRINDER, E. R. 1952. The Little Ringed Plover in Great Britain in 1950. *Brit. Birds*, **45** (2): 61-64.—For the seventh year in succession *Charadrius dubius* bred in England; 20 pairs were known to have nested, while 8 others may have done so.
- PATTEN, J. A. 1952. The life cycle of *Conspicuum icteridorum* Denton and Byrd 1951 (Trematoda: Dicrocoeliidae). *Journ. Parasit.*, **38** (2): 165-182.—The first intermediate host is a land snail; second intermediate hosts are pill bugs and sow bugs; final host is the Purple Grackle.
- PEARSE, THEOD. 1952. Notes on the occurrence and behavior of the Stilt Sandpiper in Vancouver Island. *Condor*, **54** (2): 111-112.—Eleven records through several years suggest that the species is a regular migrant along the inner shoreline in the late summer.
- PETRIDES, GEORGE A., AND RALPH B. NESTLER. 1952. Further notes on age determination in juvenile Bobwhite Quails. *Journ. Wildl. Manag.*, **16** (1): 109-110.—Added data on the average ages of various stages of postjuvenile wing molt in *Colinus virginianus*.
- PHELPS, WILLIAM H., AND WILLIAM H. PHELPS, JR. 1952. Nine new subspecies of birds from Venezuela. *Proc. Biol. Soc. Wash.*, **65**: 39-54.—*Crypturellus undulatus manapiare* (San Juan de Manapiare, Rio Manapiare, Terr. Amazonas), *Lurocalis semitorquatus schaeferi* (Rancho Grande, Estado Aragua), *Nyctiprogne leucopygia pallida* (San Fernando de Apure, Estado Apure), *Phaethornis longuemareus imatacae* (Cerro Tomasote, El Palmer, Estado Bolivar), *Colibri coruscans rostratus* (Cerro Huachamacare, Rio Cunucunuma, Terr. Amazonas), *Xiphorhynchus picus deltaeus* (Misión Araguaimujo, Terr. Delta Amacuro), *Glyphorhynchus spirurus amacurensis* (Jobure, Rio Jobure, Terr. Delta Amacuro), *Myrmotherula behni camanii* (Cerro Camani, Terr. Amazonas), and *Pipromorpha oleaginea dorsalis* (Cerro Roraima, Gran Sabana, Estado Bolivar).
- PHILLIPS, ALLAN R., AND DEAN AMADON. 1952. Some birds of northwestern Sonora, Mexico. *Condor*, **54** (3): 163-168.—Sixty-two species accounts.
- PRESTON, F. W. 1952. Harrying the herons by gulls—a further note. *Wilson Bull.*, **64** (1): 45-46.—Includes notes on behavior of other species towards herons.
- PRESTWICH, ARTHUR A. 1952. Records of parrots bred in captivity, Part V. (Lovebirds and broadtails). (A. A. Prestwich, London), pp. 181-290.
- RAND, A. L. 1951. Geographical variation in the Pearl-spotted Owlet, *Glaucidium perlatus* (Vieillot). *Nat. Hist. Misc.*, No. **86**: 1-6.—Recognizes three races.
- RAND, A. L., AND R. M. RAND. 1952. Closely associated nests of Bronzed Grackle and English Sparrow. *Wilson Bull.*, **64** (2): 105, 106.—A nest of *Quiscalus quiscula* on top of a nest of *Passer domesticus*. Included are remarks on several examples of the tolerance of different species at the nest.
- RAND, A. L., AND D. S. RABOR. 1952. Two new birds from Philippine Islands. *Nat. Hist. Misc.*, No. **100**: 1-3.—*Stachyris nigrorum* (Cuernos de Negros, Negros Oriental, Negros Island), new species, and *Harpactes ardens luzoniensis* (Dinampun, Bataan Prov., Luzon Island), new subspecies.
- RAND, A. L., AND D. S. RABOR. 1952. Notes on Philippine birds. *Nat. Hist. Misc.*, No. **107**: 1-5.—Discusses *Phapitreron* and *Phylloscopus*. *Phylloscopus olivaceus luzonensis* (Massisiat, Abra Prov., Luzon Island), new subspecies.
- RAND, R. W. 1952. The birds of Hollamsbird Island, South West Africa. *Ibis*, **94** (3): 452-457.

- ROOT, OSCAR M. 1952. Clay-colored Sparrow in Massachusetts. *Wilson Bull.*, **64** (2): 110, 111.—A summary of the records of *Spizella pallida* in this state.
- ROWAN, MRS. M. K. 1951. The breeding of the Yellow-nosed Albatross: Tristan da Cunha. *Ostrich*, **22** (3): 139–155.—Detailed life history. Six photographs.
- DE SCHAUENSEE, RODOLPHE M. 1952. Columbian Zoological Survey. Part X. A collection of birds from southeastern Nariño, Colombia. *Proc. Acad. Nat. Sci. Phila.*, **104**: 1–33, 1 col. pl.—Based on more than 1000 specimens of 294 species collected at elevations above 10,000 feet, it emphasizes the presence to the south of many species previously known only to the north of Bogotá. *Piculus rubiginosus michaelis* (Rio San Miguel, se Nariño), *P. r. palmitae* (La Palmita, Magdalena), *Masius chrysopterus pax* (Cerro Pax, east slope of Andes, near Nariño) new subspecies, and *Phlegopsis barringeri* (Rio Rumiaco, se Nariño) new species.
- SCHILLER, E. L. 1952. Studies on the helminth fauna of Alaska. III.—*Hymenolepis keniensis* n. sp., a cestode from the Greater Scaup (*Aythya marila nearctica*) with remarks on endemicity. *Trans. Amer. Micro. Soc.*, **71** (2): 146–149.
- SCHILLER, E. L. 1952. Studies on the helminth fauna of Alaska. IX.—The cestode parasites of the White-fronted Goose (*Anser albifrons*) with the description of *Hymenolepis barrowensis* n. sp. *Journ. Parasit.*, **38** (1): 32–34.
- SCHORGER, A. W. 1952. Ducks killed during a storm at Hot Springs, South Dakota. *Wilson Bull.*, **64** (2): 113–114.
- SCHWILLING, MARVIN D. 1952. Breeding status of the White-necked Raven [*Corvus cryptoleucus*] in Kansas. *Wilson Bull.*, **64** (2): 114–115.
- SERGEANT, D. E. 1952. Little Auks in Britain, 1948 to 1951. *Brit. Birds*, **45** (4): 122–133.—In the winters of 1948–49 and 1949–50 Dovekies, *Alle alle*, were present in large numbers in British waters, south of their normal range; in February, 1950, many were blown into Ireland, Great Britain, and northern France. Similar “wrecks” of Dovekies occurred in 1932 and 1936 on our side of the Atlantic. Such birds are usually emaciated, perhaps from lack of rich planktonic food in the colder waters of their normal range.—Margaret M. Nice.
- SERVENTY, D. L. 1952. The bird islands of the Sahul Shelf [Australia]. *Emu*, **52** (1): 33–59, 1 map, 3 pls.—Descriptions of islands, and populations of birds on each, with seasons of nesting for each species. The problems of conservation and guano-deposition are touched briefly.
- SERVENTY, D. L., AND H. M. WHITTELL. 1952. The correct name of the Crested Penguin. *Emu*, **52** (1): 63–64.—Urge use of *Aptenodytes chrysocome* Forster, 1781.
- SKEAD, C. J. 1951. Cuckoo studies on a S. African farm (Part 1). *Ostrich*, **22** (3): 163–175.
- SKEAD, C. J. 1952. A study of the Black Crow, *Corvus capensis*. *Ibis*, **94** (3): 434–451.—Life history.
- SKUTCH, ALEXANDER F. 1952. Life history of the Chestnut-tailed Automolus. *Condor*, **54** (2): 93–100.—Observations on this member of the ovenbird family were made in the basin of El General on the Pacific side of southern Costa Rica. Description of habits, food, nests, eggs, incubation and nestings.
- SMITH, J. DONALD. 1952. The Hawaiian Goose (Nene) restoration program. *Journ. Wildl. Manag.*, **16** (1): 1–9.—*Branta sandwichensis* is now reduced to an estimated 30 birds in the wild state. Three projects are underway to raise others from 24 birds now in captivity. An intensive ecological study of the Nene in the wild is needed before any further restocking is attempted. Here surely is one of the most pressing research projects in ornithology today.—J. J. Hickey.
- SMITHERS, R. H. N. 1951. Some interesting Rhodesian records. *Ostrich*, **22** (3): 156–162.

- SNOW, D. W. 1952. A contribution to the ornithology of North-west Africa. *Ibis*, **94** (3): 473-498, 2 figs., 2 tables.—Species accounts.
- SPRUNT, ALEXANDER, JR. 1951. A list of the birds of the Dry Tortugas Keys 1857-1951. (Florida Audubon Soc.), pp. 1-27, 5 photos. Price, \$0.50.—Review of all records in literature and presentation of fall records made by author September 2 to 9, 1949.
- STALLCUP, WILLIAM B. 1952. The status of Barrow's Golden-eye [*Bucephala islandica*] in Kansas. *Wilson Bull.*, **64** (1): 43-44.
- STEVENS, O. A. 1952. Bird banding and its educational values. *Sci. Monthly*, **74** (3): 180-183.—Observations on bird banding: its history, outstanding contributions to ornithological knowledge, the role of banders as teachers, and the need for cooperation between banders and those who may be able to suggest projects likely to yield fruitful results.
- STEWART, ROBERT E., *et al.* 1952. Seasonal distribution of bird populations at the Patuxent Research Refuge. *Amer. Midl. Nat.*, **47** (2): 257-363, 8 figs., 3 tables.
- STORER, JOHN H. 1952. Bird aerodynamics. *Sci. American*, **186** (4): 24-29.—An account of how the primaries of the wings of a bird function as does the propeller of an airplane, and how the proximal parts of the bird's wings serve as the wings of a plane.
- STRESEMANN, ERWIN. 1952. On the birds collected by Pierre Poivre in Canton, Manila, India and Madagascar (1751-1756). *Ibis*, **94** (3): 499-523.—Historical, type localities, taxonomic significance.
- SUMMERS-SMITH, D. 1952. Breeding biology of the Spotted Flycatcher. *Brit. Birds*, **45** (5): 153-167.—Based on records of 548 nests of *Muscicapa striata*. Average clutch-size in southern England and Wales was about 4.2, in northern England and Scotland, 4.4. Incubation averaged 13.2 days and fledging 13.4. Nesting success was high—63 %. The birds build in protected places, against walls, in ivy, in holes in trees, in nest boxes and in nests of other species.—Margaret M. Nice.
- SUTTON, GEORGE M. 1952. The Flint-billed Woodpecker. *Wilson Bull.*, **64** (1): 4-6, 1 col. pl.—A general description of *Phloeocastes guatemalensis* and its habits.
- SWANBERG, P. O. 1952. Studies of some species rarely photographed. XXXVI. The Nutcracker. *Brit. Birds*, **45** (2): 60-61.—11 photographs of *Nucifraga c. caryocatactes* in Sweden, at the nest, in flight, and feeding.
- SWANK, WENDELL G. 1952. Trapping and marking of adult nesting doves. *Journ. Wildl. Manag.*, **16** (1): 87-90.—A two-door trap placed over the nest gave best results with *Zenaidura macroura* when the young were four to eight days old. White and yellow were the only satisfactory paints, and large feathers on the wings and tail were the best surfaces for marking.
- TRAYLOR, MELVIN A., JR. 1952. Notes on birds from the Marcapata Valley, Cuzco, Peru. *Fieldiana-Zool.*, **34** (3): 17-23.
- TRAYLOR, MELVIN A., JR. 1952. A new race of *Otus ingens* (Salvin) from Colombia. *Nat. Hist. Misc.*, No. **99**: 1-3.—*O. i. colombianus* (El Bambo, Cauca).
- UHLIG, HANS G., AND R. WAYNE BAILEY. 1952. Factors influencing the distribution and abundance of the Wild Turkey in West Virginia. *Journ. Wildl. Manag.*, **16** (1): 24-32.—A 1949-50 census revealed 6,851 *Meleagris gallopavo*, a 14 per cent increase in five years. Fall populations probably never exceed one turkey per 125 acres in this state; one winter area carried one per 171 acres of forest land. Reported hunting kill took 6 per cent in 1944, and 11.6 in 1949. Kill and mast conditions correlate with May minimum temperatures.—J. J. Hickey.

- VAURIE, CHARLES. 1951. A new species of flycatcher from Mindanao, Philippine Islands. *Amer. Mus. Novit.*, No. 1543: 1-4.—*Muscicapa crypta* from 3000 ft., Mt. McKinley, Mt. Apo Range, Davao.
- VERHEYEN, RENÉ. 1951. Description de trois Oiseaux nouveaux du Katanga (Congo belge). *Bull. Inst. royal Sci. nat. de Belgique*, 27 (50): 1-2.—*Nicator chloris katangensis* (Muno River, affluent of the Lufira, 890 meters, Katanga), *Pyrticus turdinus upemba* (Kabwe, on the Muye, affluent of the Lufira, 1400 meters, Upemba National Park, Katanga), and *Urocolius indicus lualaba* (Mulumbu, Kazadi, Lualaba district), new subspecies.
- VILLIERS, A. 1950. Contribution a l'Etude de l'Air. Oiseaux. *Mem. de l'Inst. Franc. d'Afrique Noire*, No. 10: 345-385.—An annotated list of the recorded avifauna of this mountain mass in the central, western Sahara, first made known by the explorations of Angus Buchanan for the Tring Museum some 30 years ago.
- VINCENT, JACK. 1951. The description of a new race of Richard's Pipit, *Anthus richardi* Vieillot from Basutoland. *Ann. Natal Mus.*, 12 (1): 135-136.—*Anthus richardi editus*, new subspecies from the high mountain areas of eastern Basutoland; type from Sanqubetu River, 8000 ft.
- WILLIAMSON, KENNETH (editor). 1952. Fair Isle Bird Observatory Trust. *Ann. Rept.* 1951, pp. 1-48.—Data on banding, banding returns, bird weights, migration, and ectoparasites.
- WOLFSON, ALBERT. 1952. Day length, migration, and breeding cycles in birds. *Sci. Monthly*, 74 (4): 191-200.—The role of summation of day lengths in the annual cycle of activities of birds is discussed. It is stated that summation of day lengths can explain the spring migratory behavior in migrants wintering at the equator, or in the Southern Hemisphere, and the regulation of breeding cycles in the tropics—two critical weaknesses of previous theories.
- WOOD, HAROLD B. 1952. Homing ability of female Cowbirds. *Wilson Bull.*, 64 (1): 46, 47.—Six records of females of *Molothrus ater* being transported from six to 100 miles and then returning.
- YOCOM, CHARLES F. 1952. Columbian Sharp-tailed Grouse (*Pedioecetes phasianellus columbianus*) in the state of Washington. *Amer. Midl. Nat.*, 48 (1): 185-192, 3 figs.—History and present status by counties.
- ZIMMER, JOHN T. 1952. Ornithology.—A new finch from northern Perú. *Journ. Wash. Acad. Sci.*, 42 (3): 103-104.—*Incaspiza ortizi* (near La Esperanza, Dept. Cajamarca), new species.
- ZIMMER, JOHN T. 1952. A new subspecies of pipit from Argentina and Paraguay. *Proc. Biol. Soc. Wash.*, 65: 31-34.—*Anthus chii chacoensis* (Avia Terai, Gobernación de Chaco).
- ZIMMER, JOHN T., AND WILLIAM H. PHELPS. 1952. New birds from Venezuela. *Amer. Mus. Novit.*, No. 1544: 1-7, 1 fig., 1 table.—*Chaetura spinicauda latirostris* (Jobure, Río Jobure, Terr. Delta Amacuro), *Chlorostilbon mellisuga duidae* (Mt. Duida, Terr. Amazonas), and *Elaenia dayi auyan-tepui* (Mt. Auyan-tepui, State of Bolívar) new subspecies.

OBITUARIES

FREDERICK HENRY BARRATT, elected an Associate of the American Ornithologists' Union in 1938, died in Toronto, Canada, on December 3, 1939, at the age of 21. He was born on a farm near Lindsay, Ontario, on July 15, 1918. His artistic ability was recognized by his Public School teacher and encouraged by his family. He attended Saturday morning classes at the Toronto Art Gallery, later took special art courses at the Central Technical School, and then began a short but brilliant career as a bird artist.

Between his frequent bouts of illness and hospitalization he worked with dogged determination, sketching in the field, comparing colors with specimens in the Royal Ontario Museum, studying techniques, and then painting. His paintings reflect his method. His birds have the fresh alertness of the field, the accuracy of color and plumage detail of the museum, and the sure line, clean color, and good design of a trained and sensitive artist.

Several paintings were published in 'Canadian Nature'; half a dozen were widely circulated as Christmas cards in the Canadian Artist Series. A number of his friends are the proud owners of paintings by Fred Barratt.—J. MURRAY SPEIRS.

DOROTHEA MINOLA ALICE BATE, of the British Museum, passed away on January 13, 1951, at Essex, England. Miss Bate had been a corresponding Fellow of the A.O.U. since 1920; she was also a Fellow of the Geological Society in Great Britain and the recipient of the award of the Wollarton Fund from that Society in 1940. She was born November 8, 1879, the daughter of Major H. R. Bate. Her mother was Welsh, and Dorothea's childhood was spent in the countryside of southern Wales where she developed an intense interest in the wildlife around her. Her formal "in-school" education was a matter of a few months. Nature was her first teacher. Later, in her "teens," she asked to be allowed to do volunteer work in the Bird Room of the British Museum (Natural History). At the Museum and in the field she learned anatomy, ornithology, geology, and paleontology. Although an "unofficial" member of the Museum staff until 1948, she worked there and accompanied Museum expeditions the greater part of her life. In 1948, she was officially given the position of "Officer-in-Charge" of the Tring Branch of the British Museum.

Miss Bate's field expeditions took her to various geological sites throughout the British Isles, Cyprus, Crete, Gibraltar, Corsica, Sardinia, Malta, and Palestine. In all areas she studied the living as well as the fossil fauna. Her contributions to paleontology are, therefore, unusually valuable commentaries on the ecologic relationships of the prehistoric faunas.

Miss Bate's published works date back to 1901 when she discussed her findings in a Bone Cave in the Wye Valley. Subsequent works included field notes on birds of Cyprus, and many papers on bird and mammal remains from paleontological and archaeological sites. She was closely associated with the late Percy R. Lowe and prepared the section on fossil carinate remains from China in their joint work published by the Geological Survey of China in 1931. Many of her bone identifications appeared in papers by other authors, particularly archaeologists, for she was very generous in going over material sent in to her for identification.

The charm and generosity which characterized Dorothea Bate's personality won her a host of friends. Many of them, like the writer of this note, knew her only by correspondence, but at her passing felt the loss of a personal friend.—HILDEGARDE HOWARD.

HARRIET CHAPMAN (MRS. FREDERICK L.) BATTELL, an associate of the American Ornithologists' Union since 1948, died at Paoli, Pennsylvania, October 24, 1951. She was born at Plattsmouth, Nebraska, December 11, 1870. Following graduation from Parsons College, Fairfield, Iowa, in 1892, she taught in the public schools of Salt Lake City, Utah, until her marriage in 1899.

After moving to Ames, Iowa, in 1917, she held a position in the English department of Iowa State College for several years. She resided in Ames until 1949, during which time she was active in bird work. An Audubon Christmas census was conducted for over 20 years and a sanctuary maintained where several thousand birds were banded during a period of 30 years. She was also interested in botany, especially in the native plants of Iowa. Mrs. Battell was a charter member of the Iowa Ornithologists' Union, a member of the Audubon Society, and for several years a member of the Wilson Ornithological Club.—A. W. SCHORGER.

LIDIAN EMERSON BRIDGE (MRS. EDMUND BRIDGE), a Life Associate of the American Ornithologists' Union, elected in 1902, died at West Medford, Massachusetts, October 22, 1928, at the age of 69. She was born in Boston, Massachusetts, March 3, 1859, but during the latter part of her life resided at West Medford. She and her husband were regular attendants at the annual meetings of the Union. During the 26 years of her membership Mrs. Bridge contributed 10 notes to 'The Auk,' including observations on the occurrence in eastern Massachusetts of such rare or uncommon species as the Pileated Woodpecker (1905), the Prothonotary Warbler, Mockingbird, and Lark Sparrow (1908), the American Egret, and the Red Phalarope (1914).—T. S. PALMER.

JOSEPH STOCKDALE BRIGGS, an Associate of the American Ornithologists' Union, elected in 1916, died in Norristown, Pennsylvania, December 18, 1918, in his seventy-first year. He was born in Black Hawk, Beaver County, Pennsylvania, January 8, 1848, and was a teacher by profession. At the time of his election he was nearly 69 years of age and had passed the period of his activity. It is not surprising, therefore, that during the period of his membership, as far as is known, he published little or nothing on birds.—T. S. PALMER.

WILLIAM HENRY DAFFIN, an Associate of the American Ornithologists' Union, was murdered June 20, 1902, in the wilds of Dutch Guiana, at a placer mine on the Maroni River ten days journey by boat from Paramaribo. He was born in Philadelphia, Pennsylvania, May 1, 1844, graduated from Girard College, and was 58 years of age at the time of his death. He was a taxidermist and had a collection of birds. He was elected an Associate of the Union in 1892 but published no notes in 'The Auk.' The announcement of his death at "Tacony, Philadelphia," in 'The Auk' for 1903, page 60, was erroneous and should have read: "William Henry Daffin of Tacony, Philadelphia, died June 20, 1902." Only six months before his death, a similar fate befell Perry O. Simons, an American collector, who was murdered by his guide while crossing the Andes near Cuervas, Argentina.—T. S. PALMER.

JOHN WILKINS EATON of Osterville, Massachusetts, an Associate of the American Ornithologists' Union, died June 6, 1945, in the Naval Hospital at Portland, Oregon, at the age of 44. He was born in Boston, Massachusetts, April 1, 1901, and enlisted in the Navy in World War II. He was elected an Associate of the Union in 1941, but during the comparatively short time of his membership in the Union he did not have an opportunity, apparently, to publish any notes on birds.—T. S. PALMER.

GUS AUGUST ENGELING, who was elected an Associate of the American Ornithologists' Union in 1950, was born in Beasley, Texas, January 7, 1918. During World War II, he served as navigator in the Air Force. The degree of B.S. in Wildlife Management was obtained from the Texas Agricultural and Mechanical College in January, 1948. The following month he was placed on the staff of the Texas Game, Fish and Oyster Commission. In September, 1949, he returned to his college and at the end of the academic year received his M.A. in Wildlife Management. His thesis was based on the nesting of the Mottled Duck. It was his intention to work for a Ph.D., his dissertation to be expanded to cover the entire life history of this species.

In September, 1950, he was placed in charge of the Derden Wildlife Management Area near Palestine, Texas. Every other night was spent on the refuge. Much time was devoted to bird-banding. He was very conscientious in the performance of his duties, and did not carry firearms. On the morning of December 13, 1951, while attempting to apprehend a poacher on the Area, he was shot and killed. The hidden body was not found for four days. Few members of the Union have had so tragic an end. As the Paris 'Herald-Press' (December 17, 1951) epitomized it, "And all over two ducks." He is survived by his wife, Wilma, and three children.—A. W. SCHORGER.

MARY LOUISE FOSSLER, Associate of the A.O.U. since 1950, passed away at her home in Pasadena, California, on January 22, 1952. Miss Fossler was born in Lima, Ohio, in 1868. She received the B.S. and M.A. degrees from the University of Nebraska, and the Ph.D. from the University of Chicago. In both of these universities she later taught. Dr. Fossler came to California in 1919, settling in Pasadena and taking a position on the faculty of the University of Southern California where she taught physiology and bacteriology. She was officially retired, as Assistant Professor of Zoology, in 1933. Although Dr. Fossler had been interested in birds previously, it was not until after her retirement that she considered the subject professionally. She continued to be affiliated with the University of Southern California until 1938, and during this time organized and presented the first course in ornithology given at that institution. She was a member of the Cooper Ornithological Club and the Pasadena Audubon Society.—HILDEGARDE HOWARD.

VICTOR GABORIAULT was born at St. Henri (Montreal) on September 3, 1909, the son of Albert Gaboriault and Alma Dalpé. He became an associate member of the American Ornithologists' Union in 1950.

In 1945 Gaboriault was appointed a teaching brother at St. Viateur High School in Montreal where he did much to stimulate interest in birds. Later he acted as one of the editors of the 'Viateur Naturaliste' and its successor 'Le Jeune Naturaliste' to which he contributed a series of popular articles on birds. These were widely read by students and others. He had recently been nominated to the Board of Directors of The Province of Quebec Society for the Protection of Birds of which he had been a member for several years and a contributor to the bird notes published in the Society's annual reports.

Brother Gaboriault was especially interested in the distribution and migration of birds in Quebec Province and in recent years had been actively engaged in collecting and assembling reports from observers in various sections of the province. Unfortunately a boyhood injury caused a tumor to develop in his leg. After several operations the leg was amputated, but this failed to stop the spread of the disease from which he died at Rigaud, Quebec, on March 22, 1952.—LEWIS TERRILL.

EDWARD CARLTON HOFFMAN, an Associate of the American Ornithologists' Union, died in Cleveland, Ohio, March 18, 1941, in his 57th year. He was born in Wooster, Ohio, August 4, 1884, and was elected an Associate of the Union in 1928. Although he maintained his membership for more than 12 years and operated a banding station in Lakewood, Ohio, he contributed only one brief note to 'The Auk,' in 1930, on the "Decrease of the English Sparrow."—T. S. PALMER.

CHARLES BRADLEY ISHAM, an Honorary Life Associate of the American Ornithologists' Union, died at Hyannis, Massachusetts, November 17, 1951, at the advanced age of 88. He was born in New York City on November 7, 1863. He was elected an Associate of the Union in 1891 and his 60-year period of membership was exceeded by that of few other members, while his 20-year term of Honorary Life Membership was exceeded only by that of Clark P. Streater. Apparently he published only two brief notes in 'The Auk'—on the occurrence of the Philadelphia Vireo in Vermont and the Blue-gray Gnatcatcher in New York, both in the number for January, 1902.—T. S. PALMER.

ELLSWORTH DUGANNE LUMLEY, an Associate of the American Ornithologists' Union, died in Seattle, Washington, February 10, 1950, at the age of 47 years. He was born January 19, 1903, at Pleasanton near Bear Lake, Michigan, and at the age of three came to Marysville, Washington, with his parents. He was educated at Everett High School, the State College of Washington, Western Washington College of Education, and the University of Washington where he received a B.S. in Education in 1929. From 1929 to 1937 Lumley taught biology at Great Falls High School, Montana; from 1937 to 1944 he was at Lincoln High School in Seattle, and from 1944 until his death at Roosevelt High School, also in Seattle. For several summers he served as a naturalist at Ranier National Park. Throughout his life he was an enthusiastic ornithologist and an ardent conservationist. He became an associate of the American Ornithologists' Union in 1933. He was a member of the Cooper Ornithological Club and of the Pacific Northwest Bird and Mammal Society. He maintained an active association with the Emergency Conservation Committee and was influential in the establishment of the expanded boundaries of Olympic National Park. His bibliography includes 27 titles, mostly ornithological.—D. S. FARNER.

GERTRUDE A. (MRS. HENRY J.) NUNNEMACHER, elected an Associate of the American Ornithologists' Union in 1946, died October 31, 1950, in Milwaukee, Wisconsin. She was born in this city on August 11, 1888. After attending the public schools of Milwaukee and spending a year at Smith College, she was married on February 5, 1910. She was a charter member of the Bird Group, Milwaukee City Club, and served as chairman for many years; she was also a member of the Wilson Ornithological Club and a life member of the Wisconsin Society for Ornithology.

During extensive travel in both hemispheres, she kept detailed notes on the birds and plants observed. Much time was spent in lecturing on birds and conducting field trips. Several visits to Mexico gave her a strong interest in the birds of that country. Shortly before her death she made a donation for the painting by George M. Sutton of the Crimson-collared Grosbeak, *Rhodothraupis celaeno*, that appeared in the December, 1950, issue of the 'Wilson Bulletin.' Generous contributions by Mr. Nunnemacher and friends permitted the printing of the entire December, 1951, number of the above publication as a memorial to Mrs. Nunnemacher. The Blue-hooded Euphonia, *Tanagra elegantissima*, was painted by Mr. Sutton especially for this issue. A part of the memorial comprised the donation of bird and nature books to the Boys' Club of Milwaukee. Mrs. Nunnemacher and her husband will be long remembered for their interest and generosity in civic affairs.—A. W. SCHORGER.

ARTHUR AUGUSTUS OSBORNE, an Associate of the American Ornithologists' Union, died in Peabody, Massachusetts, April 24, 1935, in his fifty-fourth year. He was the son of Calvin F. and Louisa Jones Osborne and was born July 29, 1881, in Peabody where he spent his entire life. He developed an interest in birds at an early age. After his graduation from high school he entered business and for 25 years was connected with the banking firm of Kidder, Peabody and Co.

In 1912 he was elected an Associate of the A.O.U. He was also a member of the National Association of Audubon Societies, the Niorre Science Club, Essex County Ornithological Society, and the Massachusetts Society for the Prevention of Cruelty to Animals. Although he was associated with the Union for more than 20 years, apparently he published nothing in 'The Auk.'—T. S. PALMER.

HENRY JOSEPH PERRY, an Associate of the American Ornithologists' Union for 16 years, died at Needham, Massachusetts, February 4, 1926, at the age of 55. He was born at Provincetown, Massachusetts, January 28, 1871, and was elected to the Union in 1909.

Dr. Perry was a regular attendant at the meetings; he was always one of the first arrivals and remained throughout the sessions. Although he took no active part in the program and did not contribute any notes to 'The Auk,' he seemed to derive much satisfaction from the meetings.—T. S. PALMER.

EUGENE WILLIAM SCHMIDT, an Associate of the American Ornithologists' Union since 1927, died August 27, 1951, at New Britain Hospital. He was born in New Britain, Conn., March 21, 1878. On June 17, 1903, he married Clara Northrup of New Britain. Surviving are two children, Mrs. Edward Packtor of Wethersfield and Eugene M. of New Britain.

Mr. Schmidt was an expert toolmaker at the Stanley Rule and Level Co. and New Britain Machine Co. As a youth he became interested in bird study and like others of that era devoted much time to collecting eggs and specimens for museums. The New Britain Institute Museum prizes the Schmidt Collection of over 300 birds from central Connecticut. His profound interest in classical music and philosophy added to his well-rounded self-education. He was outstanding in his knowledge of bird life in Connecticut, having associated closely many years with John H. Sage and C. W. Vibert. Long an active member of the Hartford (Conn.) Bird Study Club he contributed greatly to the welfare of that active club. Every May for many years the Club journeyed to the region which Gene had covered so thoroughly every week from 1897 until 1948 when his health made him reluctantly forego active birding.

Mr. Schmidt was an authority on local flora as well, and in his later years he became expert in photographing both plants and birds in their natural habitats. His artistic films became noted, and he enjoyed showing them frequently. After his wife's death in 1944 he spent a number of winters in Florida—although he insisted on returning to Connecticut early as he "just had to be there to greet the birds on their return to his beloved region."

Mr. Schmidt contributed numerous items to the old 'Bird-Lore' and his carefully recorded notes of all his countless field trips extending over nearly 50 years proved of great value to both Forbush and Eliot in preparing their books on New England birds.

A field trip with Eugene Schmidt was an experience long to be remembered, not only for his comments on the changes in bird and plant life within a specific territory during half a century, but especially for the philosophy of one "who in the love of Nature held communion with her visible forms" through every type of New England weather.—ROBERT F. BELDEN.

CHARLES EDWIN SHAWEN, an Associate of the American Ornithologists' Union, elected in 1949, died in Dayton, Ohio, August 24, 1951. He was born in this city on November 4, 1875. After attending the Chicago Homeopathic Medical College and Rush Medical College (University of Chicago), he served his community as a physician and surgeon. He was a member of the State and National Audubon societies and maintained large sections of his estate as a bird sanctuary. Floriculture was a dominating interest. Among his benefactions was the donation of land for the site of the county children's home.—A. W. SCHORGER.

HELEN GRANGER WHITTLE, a Life Associate of the American Ornithologists' Union, elected in 1904, died in Hillsboro, N. H., August 4, 1951. She was born in Greenland, N. H., September 29, 1876. Following graduation at St. Johnsbury (Vermont) Academy in 1896, she took work at the Beale Secretarial School in Boston, and was later employed in several capacities at Harvard University. Following a course in horticulture at Massachusetts State College of Agriculture, she was for 17 years superintendent of grounds and gardens on the 1200-acre estate of Mrs. Clara Bass of Peterborough, N. H.

Mrs. Whittle was interested in birds throughout her life. For nearly fifteen years she assisted her husband, Charles Livy Whittle, in editing the 'Bulletin of the North-eastern Bird-Banding Association' and its continuation 'Bird-Banding'. Together they operated a bird banding station for many years. Aside from her interests in ornithology and horticulture, she did much antiquarian research on old homes and building sites in Hancock and Peterborough, N. H.—A. W. SCHORGER.

BURTIS HARRIS WILSON, elected an Associate of the American Ornithologists' Union in 1939, was born at Shavertown, Delaware County, New York, on October 11, 1872, and while very young moved to Davenport, Iowa. While growing up in Davenport he spent all his spare time in quest of local bird life and kept accurate records of his observations for many years. He published the first paper on the ornithology of the Scott County, Iowa, area, as well as the only published record of the nesting of the Brown Creeper in Iowa. On May 1, 1896, he married Lucy May Baker of Rock Island, Illinois, and as a result of that union three children were born.

Mr. Wilson went into the lecturing business on a small scale and was in much demand in that capacity. He was one of the first to use lantern slides to illustrate his lectures and this added to their popularity. For many years he led a class of bird students on a New Year's day walk.

Just before the start of World War I, he moved to Peroia, later to Joliet, Illinois, and finally to Chicago, where he lived until his death on September 10, 1940. His entire library, including his personal notes, was left to the Davenport Public Museum. As a result of his activity we have an excellent idea of the avifauna of this area before the turn of the century. To Burtis H. Wilson, the students of this region owe a great deal.—JAMES HODGES.

TOM AND ARLENE HADLEY, a nature team, have appeared throughout the nation on Audubon Screen Tour Lectures. They are shown here recording the songs of birds with the aid of a parabolic sound reflector. Formerly a General Motors executive, Mr. Hadley has infected thousands with his enthusiasm as a naturalist, wild-life photographer and philosopher.



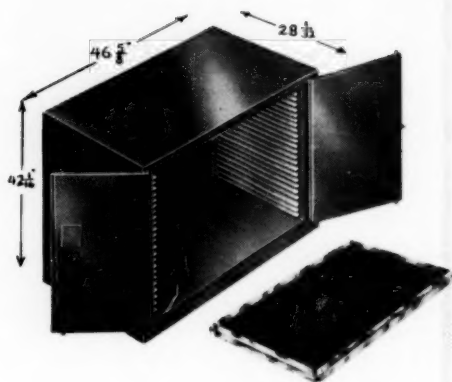
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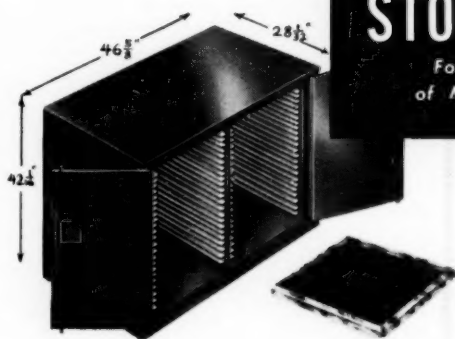




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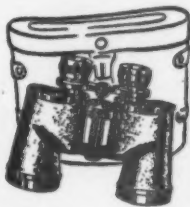
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